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Issued September, 1960

SOIL SURVEY

Frederick County Maryland

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
MARYLAND AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Frederick County will help farmers in planning the kind of management that will protect their soils and provide good yields; it will assist engineers in selecting sites for roads, buildings, ponds, drainage and irrigation structures, and other structures; it will assist those interested in establishing or improving woodland; and it will add to the soil scientists' fund of knowledge.

In making this survey, soil scientists dug holes and examined surface soils and subsoils; measured slopes; and observed differences in growth of crops, weeds, and trees. They recorded everything about the soils that they believed might affect their suitability for farming, forestry, engineering, and related uses. The scientists plotted the boundaries of the different soils on aerial photographs. Then cartographers prepared from the photographs the detailed soil map in the back of this report. Fields, woods, roads, and many other landmarks can be seen on the map.

Locating the soils

You can use the index to map sheets to find out which sheet of the large map covers the area you wish to study. The index is a small map of the county, on which numbered rectangles have been drawn to indicate what part of the county is shown on each sheet of the large map. Boundaries of the soils are outlined on each sheet, and each kind of soil has a special symbol. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map. Suppose, for example, an area located on the map has a symbol PbC2. The legend for the detailed map shows that this symbol identifies Penn loam, 8 to 15 percent slopes, moderately eroded. The Pb part of the symbol stands for the Penn loam soil type. The C part of the symbol is given to all the soils in the 8 to 15 percent slope range. The 2 indicates the degree of erosion, in this case, moderate. This soil and all the others mapped in the county are described in the section, Descriptions of the Soils.

Finding information

Few readers will be interested in all sections of the soil report, because it has special sections for different groups. The section that describes the physiography and climate and gives some statistics on agriculture will be of interest mainly to those not familiar with the county.

Farmers and those who work with farmers can learn about the soils from the sections, Descriptions of the Soils, Capability Groups of Soils, and Productivity Ratings. In this way they first identify the soils on their farms and then learn how these soils can be managed and what yields can be expected. The soils are grouped into capability units, that is, groups of soils that need similar management and respond in about the same way. For example, Penn loam, 8 to 15 percent slopes, moderately eroded, is in capability unit IIIe-10. The management this soil needs will be described under the heading, Capability unit IIIe–10, in the section, Capability Groups of Soils. Those farmers interested in woodland management can find some suggestions in the section, Forests of the County.

Engineers can refer to the section, Engineering Properties of Soils. Tables in that section show the depth to bedrock, the texture of soil layers, drainage, and other characteristics of the soils that affect engineering.

Soil scientists can find information about how the soils were formed and how they were classified in the section, Soil Formation and Classification.

* * * *

Soil terms that may be unfamiliar to some readers are defined in the Glossary. The Guide to mapping units and capability units, on pages 141–144 of this report, lists the mapping units, gives the map symbol and capability unit of each, and tells where to find information about each soil.

This soil survey was made as part of the technical assistance furnished by the Soil Conservation Service to the Catoctin Soil Conservation District and to the Frederick Soil Conservation District, formerly part of the Monocacy Soil Conservation District.

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SOIL SURVEY OF FREDERICK COUNTY, MARYLAND

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CORRELATION BY MORRIS E. AUSTIN, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH MARYLAND AGRICULTURAL EXPERIMENT STATION

THE SOILS of Frederick County were first surveyed in 1919 by the United States Department of Agriculture Bureau of Soils, the Maryland Agricultural Experiment Station, and the Maryland Geological Survey. The report was published by the Bureau of Soils in 1922 (*4, 5*).[1]

Individual farm maps showing soil types, slope, erosion conditions, and land use were made as part of a demonstration of soil conservation work on a few farms of the county in 1937.

The farmers of the Middletown Valley organized the Catoctin Soil Conservation District in May 1939. This local organization began a program of soil conservation and improvement of land use, with the cooperation of several State and Federal agencies. A survey of soils and land use was started by the Soil Conservation Service in July 1939 and completed in April 1941.

Farmers in the remainder of Frederick County and in that part of Carroll County drained by the Monocacy River organized the Monocacy Soil Conservation District in October 1939. The Soil Conservation Service conducted a soil survey for this district from May 1940 to July 1944. The Frederick Soil Conservation District was formed in 1944 from the part of the Monocacy Soil Conservation District that was located in Frederick County.

This survey of the soils of Frederick County covers both the Catoctin and the Frederick Soil Conservation Districts, which extend over the entire county. It was made by the Soil Conservation Service of the United States Department of Agriculture, in cooperation with the Maryland Agricultural Experiment Station. The basic fieldwork was completed in 1944. Since that time, the field maps have been used in soil conservation work in the county. In 1956, some of the fieldwork was brought up to date, detailed descriptions of all of the soils were made, and other data were compiled. Unless otherwise specifically stated, all statements in this report refer to conditions in the county in 1956.

[1] Italic numbers in parentheses refer to Literature Cited, p. 140.

Soil Series and Their Relation to Topography

The soils of Frederick County can be considered in four broad groups according to their position on the landscape: Soils of the uplands, soils of the colluvial fans and slopes, soils of the old stream terraces, and soils of the bottom lands and flood plains. Within these broad topographic groups, the soil series vary according to the parent material from which they developed and according to their drainage.

Table 1 shows these relationships among the soil series in Frederick County.

Soils of the uplands

About 87 percent of the land area of Frederick County consists of upland soils that have developed in place from material weathered from the underlying rocks. Generally they occupy the higher areas of the county, and they occur on five widely differing kinds of topography.

The mountains and intermountain ridges in the northwestern part of the county, which extend from the Pennsylvania line to the Potomac River, are underlain by acidic rocks.

The intermountain valley areas, such as the Middletown Valley in the southwestern part of the county, have underlying rocks similar to some of those in the mountains and intermountain ridges.

The limestone valley area extends north of the city of Frederick and south to the Potomac River. The upland soils of this area have developed on rocks that are much less acid than those of the mountains and intermountain ridges and valleys.

The Triassic Lowland in this county is a belt of red shale and sandstone that extends across the county from the Potomac River to the Pennsylvania State line, with a few interruptions. It lies mostly between the foot slopes of Catoctin Mountain to the west and the limestone valley to the east.

The Piedmont Plateau is in the eastern third of the county. It consists of many kinds of rock, the most common of which is mica-schist.

TABLE 1.—*Relationships of the soil series according to topographic position, parent material, and drainage*

Position and parent material	Drainage class						
	Excessively drained	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Uplands:							
Mountains and intermountain ridges:							
Quartzitic sandstone	Dekalb		Clymer				
Metabasalt and some quartzite			Fauquier, Highfield.			Rohrersville[1]	Lantz.[1]
Micaceous and talcose schists		Chandler, Talladega.		Glenville[1]	Glenville[1]	Worsham[1]	
Quartzose schist and quartz conglomerate			Edgemont	Glenville[1]	Glenville[1]	Worsham[1]	
Intermountain valleys:							
Metabasalt and some quartzite		Catoctin	Myersville, Fauquier.			Rohrersville[1]	
Limestone valleys:							
Massive hard limestone			Hagerstown		Colbert	Guthrie[1]	
Limestone and calcareous shale			Duffield		Colbert	Guthrie[1]	
Shaly siliceous limestone			Frankstown		Colbert	Guthrie[1]	
Triassic Plain:							
Red shale and sandstone		Penn, Bucks	Penn	Readington		Croton[1]	
Gray to olive shale and sandstone			Lansdale		Chalfont	Croton[1]	
Bluish to greenish porcelanite				Lehigh	Lehigh	Watchung[1]	Watchung.[1]
Limestone breccia or conglomerate			Athol		Colbert		
Piedmont Plateau:							
Calciferous schist and marble			Conestoga				
Mica schist and some quartzite	Manor	Manor	Glenelg, Chester, Elioak.	Glenville[1]	Glenville[1]	Worsham[1]	
Coarse-grained gneiss	Brandywine			Glenville[1]	Glenville[1]	Worsham[1]	
Slaty quartzite		Cardiff		Glenville[1]	Glenville[1]	Worsham[1]	
Quartzite conglomerate and quartz schist			Edgemont	Glenville[1]	Glenville[1]	Worsham[1]	
Meta-igneous phyllite	Linganore			Urbana		Worsham[1]	
Intrusive diabase			Montalto, Legore.			Watchung[1]	Watchung.[1]

Old colluvial fans and slopes:							
Mixed colluvium from metabasalt and Triassic rocks			Norton			Roanoke	
Debris from metabasalt and sandstone			Braddock, Thurmont.	Augusta		Roanoke	
Old stream terraces:							
Old alluvium, mainly from limestone materials			Elk	Captina			
Old alluvial sands over limestone bedrock		Sequatchie[2]					
Old alluvium, mainly from sandstone, shale, and quartzite			Waynesboro				
Old alluvium, mainly from gneiss and schist				Augusta		Roanoke	
Old alluvium, mainly from metabasalt, sandstone, and quartzite			Thurmont	Augusta		Roanoke	
Old alluvium, mainly from Triassic shale and sandstone			Birdsboro	Raritan			
Bottom lands and flood plains:							
Recent alluvium, mainly from limestone materials			Huntington	Lindside	Lindside	Melvin	
Recent alluvium, mainly from Triassic materials			Bermudian	Rowland	Rowland	Bowmansville	
Recent alluvium, mainly from crystalline materials			Congaree	Chewacla	Chewacla	Wehadkee	

[1] Only the lower part of these soils developed from residuum. Their surfaces are more or less strongly influenced by accumulations of local fine-grained colluvium.

[2] These soils probably developed partly from residuum from the underlying limestone formations.

Soils of the colluvial fans and slopes

Colluvial fans are masses of rock and soil debris that collect at the foot of mountain slopes. The largest colluvial area in Frederick County extends along the lower eastern foot slopes of Catoctin Mountain, between Mount St. Marys College and Indian Springs. Another large area lies along the eastern base of South Mountain from a point south of Lambs Knoll nearly to the Potomac River. Another smaller area is near Edgewood.

The colluvial deposits nearest the base of the mountains are composed of greenstone or metabasalt mixed with sandstone debris and some quartzite. The colluvial material that moved farther out into the valleys came from the same kinds of rock, but it was mixed with the red shale and sandstone of the valley floor.

Soils of the stream terraces

The old stream terraces are former flood plains of rivers and streams. Soil material was deposited on these flood plains when the stream beds were at a higher level than at present. This old alluvial material is of mixed origin, but in most places material from one general kind of rock is dominant.

Soils of the bottom lands and flood plains

The alluvial deposits on the bottom lands and flood plains are fairly recent. Most of these areas are still flooded at times. In many places the soil does not show any development of horizons; in other places a weak development has taken place. The kind of soil that is present depends chiefly on the kinds of rock and soil from which the material was washed.

General Soil Map

In a county or other large expanse, it is fairly easy to see differences in the landscape from place to place. Some of the more obvious differences are in the shape, steepness, and length of slopes, in the width, volume, and speed of streams and the shape and size of their valleys, and in the kinds of wild vegetation and its condition. Another less obvious difference is in the kinds of soils that have developed and the patterns in which they occur on the landscape.

By drawing lines around the different patterns of soils on a small map, we get a general map of the soils. The pattern of soils is not strictly uniform in each area, but the same soils are present in somewhat the same arrangement. Such a map is useful to those who want a general idea of the soils, who want to compare different parts of a county, or who want to locate large areas suitable for some particular kind of farming or other general land use. It does not show accurately the kinds of soil on a single farm or a small tract.

The 21 general soil areas of Frederick County are shown on the colored map at the back of this report. Each area is named after the soil series dominant in that area. The general soil areas are grouped under seven important physiographic divisions.

Brief descriptions of the physiographic divisions and the general soil areas follow. For more detailed information about the soils, see the detailed soil map and the section, Descriptions of the Soils.

Stony or Steep, Shallow Soils of Mountain and Elevated Intermountain Areas

This division consists of the mountainous parts of the county. Not all of it is high in elevation, but it is higher than surrounding areas, and the soils are those common in mountainous regions. It contains two main mountain ranges, South Mountain and Catoctin Mountain, which extend northward from the Potomac River. These ranges are interconnected north of Ellerton by a system of high intermountain ridges, plateaus, and ravines. One isolated peak, Sugarloaf Mountain, rises from the Piedmont Plateau in the extreme southern part of the county near the Montgomery County line. The highest point in Frederick County is at the Foxville lookout tower on Catoctin Mountain, at an elevation of 1,917 feet. Lambs Knoll on South Mountain rises to an elevation of 1,772 feet, and Sugarloaf Mountain, to 1,280 feet.

This is generally an area of steep slopes, but it includes many more or less level areas on top of and between mountains. Most of the soils are thin and moderately to severely eroded. Many of them are stony. There are some fairly deep, well-developed soils in the level areas.

Much of this area is forested, especially those parts in State and National parks and forests. Much of the privately owned acreage is forested also.

The farms are small. Most of them are general farms on which corn, small grain, and hay are grown in rotation. On most farms there is some livestock, but there is practically no commercial dairying. Some farmers raise turkeys and other poultry. Peaches and some apples and berries are grown, as well as some vegetables for home use and for local markets.

There are some good pastures in this area, but most of them are small. Weedy and brushy pastures are common because much of the acreage is too stony for mechanical mowing.

1. Dekalb-Clymer

This general soil area covers most of the ridgetop of South Mountain. On Catoctin Mountain it occupies Round Top, the area between United States Highway No. 40 and Gambrill State Park, and the area of Five Forks between Mountaindale and Middlepoint. It makes up a little more than 1 percent of the county.

The soils in this area are Dekalb very stony loam, Dekalb loam, Clymer very stony loam, and Rough stony land on sandstone or Dekalb soil material. A few small spots of alluvial soils and other soils, such as Lantz very stony loam, are included. All of these soils except Dekalb loam are stony to very stony. A small part of the Dekalb soils and most of the Clymer soil are fairly level, but the rest of this general soil area is steep and rough.

A considerable part of this area is owned by the State, but some is privately owned. Almost all of it is in forest, which is the best use for it. There are 182 acres of Dekalb loams that could be cultivated, but the soil is droughty, very thin, strongly acid, low

in fertility, and low in productivity. The other soils of this general area are too stony for cultivation. Some might be developed as pasture.

2. *Edgemont-Dekalb*

This general soil area consists entirely of Sugarloaf Mountain. It occupies less than 1 percent of the county. It is made up of Edgemont gravelly loam, Dekalb very stony loam, Edgemont very stony loam, and Rough stony land on sandstone or Dekalb soil material.

Practically all of this general soil area is in forest, and it should remain so. A few acres of Edgemont gravelly loam could be cultivated.

3. *Edgemont-Chandler-Dekalb*

The largest example of this general soil area is that part of Catoctin Mountain from Gambrill State Park north-northeastward to about 3 miles north of Thurmont. Another area is just west of Mount St. Marys College, and one long narrow strip lies on the crest of Catoctin Mountain south of United States Highway No. 40. Altogether, this general soil area makes up about 7 percent of Frederick County.

The chief soils in this area are Edgemont-Chandler channery loams, Edgemont-Chandler very stony loams, Dekalb very stony loams, and Rough stony land that consists of Edgemont-Chandler and Dekalb soil materials. The Chandler soils developed from rocks that had a large content of mica and talc.

Some part of this general soil area would be suitable for limited cultivation or for pasture. The rest should remain in forest, except for residential sites.

4. *Chandler-Talladega*

This area is on low mountains and some of their lower slopes and spurs. It makes up about 2 percent of the county. Most of it is on the eastern slope of Catoctin Mountain from around Yellow Springs southward to the Potomac River. Smaller acreages are near Middlepoint, around the Lewistown Fish Hatchery, and on United States Highway No. 40 near Wolfsville Crossing.

Nearly all of this general soil area consists of Chandler and Talladega silt loams, channery loams, and very stony loams. Small spots and strips of Congaree silt loam, Wehadkee silt loam, Chewacla silt loam, and Glenville silt loam are included. The Chandler and Talladega soils are fairly shallow, somewhat excessively drained, low in fertility, highly micaceous, and easily eroded.

The soils in this area are suitable for general farming but are not highly productive. About 23 percent of this area is good for farming but needs good management. Another 23 percent is suitable for cultivation, but it should be more intensively managed to protect it from deterioration. About 6 percent is suitable only for pasture or for occasional cultivation. A little more than 26 percent is suitable for pasture or woodland but not for cultivation. The remaining 22 percent of this area is so steep, eroded, or stony that it should be used only for forest.

5. *Highfield-Fauquier*

This is the largest general soil area in this division. It makes up about 12 percent of the entire county. Most of it is in the northwestern part of the county, from Ellerton to the Pennsylvania State line. Fringe areas extend southward around the head of Middletown Valley along South Mountain and southward to the Potomac River along Catoctin Mountain. Another area lies just west of Thurmont, between the colluvial foot slopes and the main mass of Catoctin Mountain.

The chief soils in this general soil area are Fauquier silt loam, Fauquier gravelly loam, Fauquier very stony loam, Highfield silt loam, Highfield channery loam, Highfield very stony loam, and Rough stony land on Fauquier and Highfield soil material. A very small part of the area consists of spots of Lantz, Augusta, Roanoke, Congaree, Chewacla, Wehadkee, and other alluvial soils.

The Highfield and Fauquier soils are fairly fertile and under good management are very productive. The high elevation makes the growing season shorter, the weather colder, and the frosts earlier in fall and later in spring than in most of Frederick County.

The better parts of this general soil area are suitable for general farming. The best soils are very well suited to orchards. Good alfalfa and other hay crops can be grown. Most of the crops, orchards, and pastures in the mountain and high intermountain division are in this general soil area.

About 18 percent is suitable for cultivation and needs little special management beyond those practices commonly considered good management in this area. Another 24 percent is suitable for cultivation but needs careful management to keep the soil in good condition. Nearly 3 percent is suitable only for limited cultivation and would be better used for pasture or hay. About 27 percent cannot be cultivated safely, but it can be grazed if the pastures are managed carefully. The rest, about 28 percent, is so stony or so steep and eroded, or both, that it should be used only for forest.

Rolling Soils of Intermountain Valleys

The main part of this division is the Middletown Valley, which consists of that part of the watershed of Catoctin Creek south of Ellerton and between the foot slopes of South Mountain on the west and the foot slopes of Catoctin Mountain on the east. A much smaller part of this division is in the northern part of the county, in the high intermountain valley between Sabillasville and Lantz.

The terrain is that of a rolling valley floor. A few areas are fairly level, and many areas are rather steep. Branches of Catoctin Creek and other creeks drain all parts of these intermountain valleys rapidly. Considerable acreages consist of the bottom land along the major creeks.

Nearly all of this division is very fertile and productive. Few areas are stony, and only a few areas need drainage. Erosion is the only appreciable problem, but damage has not been severe except in a few small spots.

Almost all of the acreage is in use. Family-size general farms on which dairying is strongly emphasized are most common. Corn, small grains, hay, and pasture occupy most of the soils. The bottom lands are generally in pasture.

6. Myersville-Fauquier-Catoctin

All of the intermountain valley division is in this general soil area. It makes up 11 percent of the county. The major soils are Myersville loam, Myersville gravelly loam, Myersville silt loam, Catoctin channery silt loam, Fauquier gravelly loam, Fauquier silt loam, and Fauquier loam, with its shallow phase. The Myersville soils cover about 60 percent of the area, and the Fauquier soils, which cover about 23 percent, are contained within areas of Myersville soils. The Catoctin soil is about 6 percent of the area.

The chief minor soils are the poorly drained Rohrersville silt loam of upland depressions, the well-drained Congaree silt loam of bottom lands and colluvial areas, and the moderately well drained Chewacla silt loam of the flood plains. Unimportant spots of other soils are also included in this general soil area.

Both the Myersville and Fauquier soils are deep and well drained, and they have good texture and structure. Their moisture-supplying capacity is moderate to high, and permeability is good. Fertility is high, and productivity is high under good management. The Catoctin channery silt loam is a shallow soil, somewhat excessively drained and droughty. In most places it lies on the sharper ridge crests within the areas of Myersville and Fauquier soils. The only serious problem in this general soil area is the hazard of erosion on some of the soils.

This is an area of fertile and productive soils, three-fourths of which can be cultivated regularly and will give moderately high yields. About 8 percent has only minor management problems under cultivation. About 38 percent can be cultivated with good management. Another 27 percent can be cultivated without damage if very carefully managed. About 9 percent is suitable for pasture or for part-time cultivation under extremely careful management. Nearly 9 percent can be used for pasture but is not suitable for cultivation. The remaining 9 percent is suitable only for forest.

Soils of Colluvial Foot Slopes

This division consists of colluvial foot slopes on parts of South Mountain and Catoctin Mountain, especially on the eastern slopes of Catoctin Mountain. The largest area lies between Yellow Springs and a point just north of Mount St. Marys College. Some strips extend along the larger waterways into the red shale valleys to the east. There is a small acreage around Edgewood. A long narrow strip on the eastern slope of South Mountain extends from just south of Lambs Knoll almost to the Potomac River.

In some places these colluvial areas are fairly level, but in others they are sharply sloping or hilly. Nearly all of the soils are gravelly, cobbly, or stony. Fertility and productivity are somewhat low to only moderate. Most of the soils are well drained. A few spots are somewhat poorly drained or poorly drained.

These soils are suitable for many crops. General farming is the usual pattern, and there is little commercial dairying. Most of the farms are small, and many are operated only part time. Orchards are common. Moderate numbers of chickens and turkeys are raised, but few cattle or other livestock. Much of the land is not cleared or is only partly cleared.

The chief problem is the difficulty of clearing, plowing, mowing, and cultivating soils that are very gravelly, cobbly, or very stony. The fairly low productivity discourages intensive use.

7. Braddock-Thurmont-Augusta

About 2 percent of the county consists of this general soil area. Most of the town of Thurmont and many smaller towns, including Yellow Springs, Mountaindale, St. Anthony, and Catoctin Furnace, are located on these soils. Considerable land along United States Highway No. 15, from below Catoctin Furnace almost to Emmitsburg, is in urban-type developments, although not in organized communities.

Most of the soils in this general soil area belong to the Braddock, Thurmont, and Augusta series. Some Roanoke soils are included. Both the Braddock and Thurmont series consist of well-drained soils that are gravelly to very stony. They developed on old colluvial fans. The Augusta soils are moderately well drained and in many places are very stony. The Roanoke soils are poorly drained. Both the Augusta and Roanoke soils have developed either on colluvial deposits or on old alluvial terraces that formed from colluvial materials.

Where the Braddock and Thurmont soils are not too stony, they are fairly good for agriculture. The impeded drainage and the stoniness of the Augusta soils limit them in most places to pasture or forest. The Roanoke soils are less stony than the Augusta soils, but they are so poorly drained that they are of little use except for pasture.

The soils of this general soil area are not intensively used. They are used mainly for orchards and for general farming on a part-time basis. Many small holdings consist of a residence, a few cultivated acres, a small orchard, and a pasture. More than 25 percent of the total acreage is in forest, and only 35 percent is used for crops. The rest is idle, or in urban developments, or in pasture.

Nearly all of these soils are somewhat hard to manage because of the gravel and stones. Nearly 60 percent of the area can be cultivated intensively, but much of this needs some care to prevent erosion, improve drainage, or overcome the hindrance of gravel and stones. About 10 percent of this general soil area will need very careful management if it is cultivated. About 25 percent cannot be cultivated but can be used for either pasture or forest, and about 4 percent is suitable only for forest.

8. Norton

This general soil area occupies colluvium that moved farther out into the valleys than the material on which

the soils of the Braddock-Thurmont-Augusta area developed. Considerable red shale from the valley floor has been mixed into the colluvium. The area consists almost entirely of Norton soils. It makes up only 1 percent of the county.

The Norton soils are fairly deep and well drained. They are gravelly to very stony, but generally less so than the soils in the Braddock-Thurmont-Augusta area.

The Norton soils are no more fertile than the soils of the Braddock-Thurmont-Augusta general soil area, but they are more easily managed because they are well drained, they are more nearly level, and they are less cobbly and stony. Their average productivity is higher because of better management.

Nearly all of this general soil area can be cultivated, and 76 percent of it is at present. The cultivated part of the area has, in general, only minor management problems. About 12 percent of the general soil area can be cultivated only under careful management, and 6 percent is best suited to pasture. None of it is so steep, stony, or eroded as to be limited to use for forest.

Mostly Shallow Soils of Valleys of Red Shale and Sandstone

This division occupies a large area that extends, with some interruptions, through the center of the county from the Pennsylvania State line to the Potomac River. It consists of undulating valley floors in which the underlying rock and the parent material of the soils consist almost entirely of dark-red shale and sandstone. The shale and sandstone are very resistant to weathering and soil formation; therefore, the soils that developed over them are fairly shallow in most places and have large quantities of shale or sandstone fragments in the profile.

Most of this division is nearly level, undulating, or gently rolling. Many small areas have rather steep but generally short slopes. Most of the soils are well drained to somewhat excessively drained, but a few of them are only moderately well drained or poorly drained. The fertility is not high, because the original sediments that made up the rocks contained only small amounts of plant nutrients. These soils are highly susceptible to erosion.

General farming, with considerable emphasis on small dairy enterprises, is the current farming pattern in this division. The most serious management problems result from the hazard of erosion, the low fertility, and the droughtiness of some of the soils and the wetness of others.

9. Penn-Readington-Croton

This is a large general soil area. It makes up a little more than 14 percent of Frederick County and covers the entire division of the valleys of red shale and sandstone. A fairly narrow strip extends from the Potomac River and just south of Pleasant View northward to a point just west of Frederick. A much larger part of the soil area extends from just northwest of Frederick northeastward to the Carroll County line and northward to the Pennsylvania State line. Another is near Friendship and Buckeys Mill. Three smaller spots are located just south of Thurmont between Rocky Springs Station and Shookstown. Another part of this soil area is in the extreme southern part of the county south of Furnace Ford, next to the Montgomery County line and the terraces and flood plains of the Monocacy and Potomac Rivers.

The Penn-Readington-Croton general soil area is made up almost entirely of soils of these three series. The reddish Penn soils dominate. The chief soils are Penn loam, Penn gravelly loam, Penn silt loam, Penn shaly loam, Readington silt loam, and Croton silt loam. Included are a few small areas of Chalfont silt loam, Bucks silt loam, and Penn-Lansdale loams on the uplands, Birdsboro silt loam and Raritan silt loam on old alluvial terraces, and Bermudian silt loam, Bermudian fine sandy loam, Rowland silt loam, and Bowmansville silt loam on recent flood plains.

The Penn soils are somewhat excessively drained, and the Bucks, Birdsboro, Bermudian, and Penn-Lansdale soils are all well drained. The Readington soils are only moderately well drained, because their subsoil is so plastic and tough that the movement of water in the soil is impeded. The Chalfont, Raritan, and Rowland soils are also moderately well drained. The Croton and Bowmansville soils are poorly drained. The very poorly drained spots within the Croton soils belong to the Stanton series, but because the areas are so small they are shown on the map only as wet spots.

These soils have low productivity, which results from rather low natural fertility, droughtiness, wetness on some soils, and a rather serious erosion hazard in most places. The soils are generally rather difficult to manage.

About 50 percent of this general soil area can be intensively cultivated if proper care is taken in management. About 25 percent of the area needs very careful management if it is cultivated regularly. About 8 percent can be used for limited or occasional cultivation but would be better in pasture or forest. Another 13 percent cannot be cultivated but can be used for pasture or forest. The remaining 4 percent is suitable only for forest.

Soils of Limestone Valleys

Most of this division is in the Frederick Valley, which is that part of the valley of the Monocacy River that is underlain by limestone. Another area extends from the Potomac River at Rock Hall northward almost to Braddock on United States Highway No. 40. A very small area lies just south of Mount St. Marys College on Motters Station Road.

Practically all of the soils are well drained, and only a few are at all droughty. A few small areas are very rocky and contain massive outcrops of hard limestone. The erosion hazard is not severe, because most

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of the slopes are gentle and runoff is fairly well controlled. Fertility is not a problem; these soils are among the most fertile in the county. Productivity is exceptionally high. Excellent yields are produced with normal good management.

The average farm in this area is not very large but is very prosperous. Dairying is the chief type of farming, and there is considerable general farming. There are also a few orchards and special enterprises.

10. Duffield-Hagerstown

This general soil area makes up 7 percent of Frederick County. It covers about 70 percent of the limestone valleys division.

The Duffield soils are dominant. They developed from interbedded limestone and shale. The Hagerstown soils developed from massive limestone that contains no shale. The soils of both series are very productive. Both are deep, well drained, fertile, gently sloping in most places, and easy to manage.

Among the minor soils of this area is the Frankstown shaly silt loam. It is generally like the Duffield and Hagerstown soils, but it is a little less productive, and it contains much more shale. The terrace soils belong to the Elk and Captina series, and the floodplain soils to the Huntington, Lindside, and Melvin series. A few spots of upland soils that have impeded drainage are of the Colbert and Guthrie series. Nearly all of these minor soils are productive, especially the Huntington and Elk soils.

If properly managed, 91 percent of this area can be cultivated in a regular rotation. About 15 percent has practically no limitations or hazards and will produce excellent crops. Another 66 percent will produce excellent crops if managed with moderate care to overcome minor limitations and hazards. About 10 percent has poor drainage and more severe hazards of erosion, but careful management can offset these.

Only 4 percent of this general soil area is limited to occasional cultivation because of rockiness or erosion hazard. Another 4 percent can be used only for pasture or forest because it is more rocky or poorly drained. Less than 1 percent is so eroded or rocky that it should be kept in forest.

11. Sequatchie-Hagerstown

This general soil area is very small. It merges with the Duffield-Hagerstown area. It makes up less than 1 percent of the county. It consists of the very sandy soils of the Sequatchie series and the Hagerstown loams. Some spots of Elk loam on the river terraces are included.

The soils in this general soil area are a little less productive than the soils in the Duffield-Hagerstown area because their sandiness makes them a little more droughty. The droughtiness is not severe except in the very sandiest spots. Erosion is the only important hazard.

All of the acreage can be cultivated. About 78 percent needs only good management. The remaining 22 percent should be carefully managed to protect it under cultivation. All of these soils are good for pasture, but they need not be limited to that use.

12. Athol

Less than 2 percent of the county consists of this general soil area, most of which is located around the edges of the limestone valleys. The parent material of the soils is limestone mixed with red shale and sandstone.

Only one soil series, the Athol, is important in this general soil area. Minor spots of Guthrie, Colbert, and Lindside soils are included.

The Athol soils are dark reddish brown like the soils on red shale, but they more nearly resemble the soils on limestone in capability, productivity, and management problems. They are only a little less productive than the Duffield and Hagerstown soils. The Athol soils are a little harder to manage because they are gravelly and, in some places near the Potomac River, rocky.

All of this general soil area can be cultivated, but 6 percent is limited to occasional cultivation and pasture. About 16 percent has only minor problems of management, and 69 percent needs only reasonable care to protect the soils. About 9 percent needs to be carefully managed under cultivation.

Soils of the Piedmont Plateau

The broad, rolling Piedmont Plateau in the eastern and southeastern parts of Frederick County covers about one-third of the county area. The rock materials and the soils derived from them vary considerably throughout. In most places the topography is rolling. In some places it is hilly to steep, and in a few places it is nearly level.

Most of the soils are well drained, and some are excessively drained. Fertility varies considerably. Only a few soils have very high fertility. Productivity varies also. It is a little higher than the productivity of the soils in the red shale and sandstone valleys, but it is not nearly so high as that of the soils in the intermountain valleys or the limestone valleys. Some excellent farmland is located in the Piedmont Plateau division. The Conestoga, Chester, Glenelg, and Elioak silt loams are especially good. Some of the soils, especially the Linganore, Brandywine, and Urbana, are much poorer. Other soils are between these extremes.

General farming is most common. Dairying is emphasized, but not so much as it is in the more productive parts of the county. More acreage is in forest than in any other division except the mountain division.

The soils of the Piedmont Plateau present many management problems, the nature and intensity of which vary considerably because of the variability in characteristics of the soils. Erosion control is the most common and most serious problem.

13. Montalto-Lehigh-Watchung

This general soil area makes up only about one-half of 1 percent of the county. All of it is located at the northern end of the county, along the Pennsylvania State line. It is surrounded by the red shale soils of the Penn-Readington-Croton general soil area.

The soils in this general area developed either directly from hard, basic, volcanic rock or from materials strongly altered or influenced by the intrusion of such rock. The Montalto soils, which developed from the volcanic rock, are very fine textured, deep, well drained, and productive. The Legore soils, which formed from the same materials, are shallower and less productive. The Lehigh soils, developed from baked shale, are shallow, only moderately well drained, and much less productive than the Montalto soils. The Watchung soils also developed from baked shale, but in poorly drained positions.

This area is used for general crops. Small-grain crops are very good. Dairying is important. The Watchung soils are generally too poorly drained for crops. If drained and well managed, they are suitable for pasture. Erosion control is the chief management problem on all of these soils except those of the Watchung series.

About half of this area can be cultivated. Good management is necessary. About 7 percent has few problems, but 45 percent must be carefully protected against erosion. Another 6 percent can be used for limited cultivation or for pasture. Pasture is the best use for 26 percent of this general soil area, and the remaining 16 percent is suitable only for forest.

14. Cardiff

This general soil area consists almost entirely of Cardiff soils, which developed from slaty quartzite on long ridges. These ridges extend from just south of New Midway to the confluence of the Potomac and Monocacy Rivers, with interruptions west of Daysville and east of Buckeystown. A few draws and pockets within the general soil area contain Congaree silt loam. This general soil area makes up only about 2 percent of the county.

The pale-yellow Cardiff soils are shallow, skeletal, somewhat droughty, and fairly low in fertility. All of them are eroded moderately, severely, or very severely. The slopes vary from nearly level to very steep.

General agriculture and dairying are practiced in this area. The Cardiff soils are generally low in productivity, but most farms have some acreages of better soils in addition to the Cardiff soils.

All of this general soil area has management problems, but 40 percent of it can safely be cultivated if well managed. Another 19 percent can be cultivated under very careful management. Limited cultivation is possible on 18 percent of this soil, but pasture or forest are better uses for it. About 13 percent is suitable only for pasture or forest, and 10 percent cannot be used even for pasture.

15. Manor-Glenelg

This general soil area makes up about 13 percent of Frederick County. It occurs in the eastern third of the county. More than 60 percent consists of Manor soils and about 30 percent of Glenelg soils. The remainder, less than 10 percent, is made up of patches of other soils, including the Chester, Elioak, Edgemont, and Linganore soils of the well-drained uplands, the Glenville and Worsham soils of the moderately well drained and poorly drained upland depressions, and the Chewacla and Wehadkee soils of the moderately well drained and poorly drained spots on flood plains.

The Manor soils, which dominate this general soil area, are fairly shallow and skeletal. They are somewhat excessively drained to excessively drained, and they tend to be droughty in some seasons. They have only moderate fertility, but they can be made fairly productive by applying fertilizer, growing cover crops, and using other good management practices. They are very susceptible to erosion. The Glenelg, Chester, and Elioak soils are deeper, more fertile, and more productive than the Manor soils. They are well drained but not excessively drained.

The productivity of this general soil area is somewhat higher than that of some of the others in the Piedmont Plateau division. The Glenelg soils are extensive enough to raise the general productivity level, but the minor soils are not extensive enough to have much influence.

Only about 1 percent of this general soil area has minor management problems. About 33 percent of it can be cultivated if some precautions are taken against erosion. Another 30 percent needs very careful management, but it can be cultivated also. About 11 percent is suitable for only limited or occasional cultivation. For about 22 percent, pasture is the most intensive use that is suitable, and 3 percent should be kept in forest.

16. Conestoga-Manor

This general soil area is the most productive in the Piedmont Plateau division, but it covers less than 1 percent of the county. The chief soils are of the Conestoga and Manor series. Very small areas of Linganore, Urbana, Glenville, Chewacla, and Wehadkee soils are included.

The Conestoga soils are derived from mica-schist that is strongly influenced by lime. Boulders and outcrops of hard marble are not uncommon in this soil. The soil is moderately deep to deep. It is well drained. Its moisture-supplying capacity is higher than that of most of the soils of the Piedmont Plateau. The fertility level is very high. This soil erodes so readily that it needs especially careful management. The Manor soils are discussed under the Manor-Glenelg general soil area.

General farming and dairying are the common pattern of use in this general soil area. All crops, especially alfalfa and other legumes, grow well.

About 50 percent of this general soil association

can be cultivated regularly if erosion is controlled. Another 22 percent can be cultivated only if very carefully managed. About 20 percent is suitable for only limited or occasional cultivation. Only 7 percent is so steep or eroded that it must be limited to pasture. The acreage not suitable even for pasture is only about 1 percent of the area.

17. Manor-Edgemont-Brandywine

This general soil area covers about 6 percent of the county. It is dominated by Manor channery and gravelly loams, especially the steeper and more eroded units of these soils. Edgemont gravelly loam, Brandywine gravelly loam, and spots of Linganore soils are also found in this general soil area.

The Manor soils are shallow, droughty, and erodible, but they can be made fairly productive. The Edgemont soils, especially where they are not too stony, are fairly good agricultural soils. They are deep and well drained, and they have good moisture-supplying capacity. They are acid in reaction and low in fertility. The Brandywine soils are also acid and low in fertility. They are thin and droughty and very gravelly. The Linganore soils are slaty and very shallow. Altogether, this general soil area is very low in productivity.

Dairying is the chief agricultural enterprise. Farms are larger than the average for the county, because more acreage is required to produce the grain, hay, and pasture needed for dairying. More of this area is in forest than of any other general soil area in the county, except those in the mountains.

About 26 percent of this general area can be cultivated under ordinary good management to control erosion, and about 32 percent will need very careful erosion control practices if it is cultivated. Another 13 percent can be cultivated part of the time if carefully managed. Pasture is the best use for 19 percent of the area, and 10 percent should be used for nothing more intensive than forest.

18. Manor-Linganore-Montalto

About 3 percent of the county is covered by this general soil area. Soils of the Manor and the Linganore series are almost equally extensive, and the Montalto is the only other important series. Spots of Urbana, Edgemont, Legore, Glenville, Worsham, Chewacla, and Wehadkee soils are included.

This is an area dominated by thin, droughty, slaty soils of low productivity, but it contains much smaller areas of finer textured and more fertile soils such as the Montalto and Legore. Generally these soils are much less productive than those of other general soil areas. There are some areas of highly productive Montalto soils, large areas of unproductive to moderately productive Manor soils, and very large areas of thin, droughty, unproductive Linganore soils, many of which are steep and severely eroded.

About 63 percent of this area is suitable for cultivation, although it is not very productive. About 27 percent needs good management to prevent erosion, and extremely careful management will be necessary on 36 percent. Occasional cultivation is possible for another 12 percent. For 13 percent, pasture is the most intensive use that is suitable. For the remaining 12 percent, forest is the best use.

19. Manor-Linganore-Urbana

This is the next-to-largest general soil area in the Piedmont Plateau division. It covers 11 percent of the county. It consists principally of Manor channery and gravelly loams on various slopes and kinds of topography. Some ridges covered by thin, droughty Linganore channery and gravelly loams and some upland flats occupied by Urbana silt loam are part of this area.

The Urbana soils are moderately well drained. Generally they occupy small, nearly level, upland plateaus and are surrounded by steeper areas of other soils. The more strongly sloping Urbana soils are moderately to severely eroded in many places, because the slow drainage through the soil allows most of the water to run off. The Urbana soils are used almost entirely for hay and pasture. Grain and other crops are usually grown on better drained lands.

This general soil area is not highly productive. About 28 percent of it is suitable for cultivation under management practices that will control erosion and improve drainage. Another 31 percent can also be cultivated. It needs intensive management. About 13 percent is suitable for only occasional or limited cultivation. For 16 percent, pasture is the most intensive use that is suitable, and the remaining 12 percent should be kept in forest.

Soils of River Terraces and Flood Plains

This division is located along the Potomac and Monocacy Rivers and along some of the smaller streams. Only the larger areas are shown on the general soil map; most areas are too small to be shown on a map of this scale.

Most of this division is used for agriculture, except for some industrial and semiurban areas. The soils are generally suitable for cultivation, and some of them are highly productive.

The two chief problems are controlling erosion on the terraces and preventing floods on the bottom lands. Erosion can be controlled by proper management of the soils. The control of floods is a more serious problem and one that cannot always be undertaken by the individual. Some improvement can be made in a few places on very small streams by cleaning and straightening streambanks or deepening channels. Permanent improvement can be made only by measures that would protect the whole watershed.

20. Waynesboro-Captina-Huntington

This general soil area is composed of a long narrow strip of terraces and flood plains next to the

Potomac River and the lower course of the Monocacy River. It makes up less than 1 percent of the county.

In the western part of this general soil area, and as far east as Point of Rocks, the chief terrace soil is Waynesboro gravelly loam. In the eastern part, Captina silt loam is the most common terrace soil, and some very small spots are Elk loam or Elk gravelly loam. On the flood plains, the Huntington soils are the most extensive. In the western part of the area, Huntington fine sandy loam is most common, and in the eastern part, Huntington silt loam. A few minor areas of Lindside silt loam are on the flood plains.

All of this general soil area can be cultivated. The terrace soils need erosion control. The Captina soils need some improvement of drainage as well as erosion control. The flood-plain soils are level in most places, fertile, and very highly productive. The danger of flooding must always be considered, even though the Huntington soils are high enough to be unaffected by any but the most severe floods.

Only good management is needed on 39 percent of this general soil area. Some additional erosion control practices or drainage measures are needed on 54 percent of the area. The areas that need intensive management practices to drain the soil or control erosion amount to only 7 percent of the total.

21. Elk-Captina-Huntington

This is a very small general soil area, comprising less than 1 percent of the county. It is located on the terraces and flood plains of the Monocacy River and extends from a point east of Buckeystown to just below Lilypons Bridge.

The chief soils in this general soil area are Elk loam, Elk gravelly loam, Captina silt loam, and Huntington silt loam. All of these were derived from old or recent limestone sediments.

These soils are less likely to be flooded than the soils in the Waynesboro-Captina-Huntington general soil area, because the Monocacy River is a smaller stream than the Potomac River, and its watershed area is partly protected by a few dams, ponds, and other structures that control runoff and floodwaters. Some floods still occur, however.

All of this area can be cultivated. About 49 percent needs only good management practices to protect it under cultivation. Another 46 percent needs only a few additional practices to prevent erosion. Only 5 percent will have to be carefully managed when it is cultivated.

Capability Groups of Soils

Capability grouping is a system of classification used to show the relative suitability of soils for crops, pasture, forestry, or wildlife (*3*). It is a practical grouping based on the needs and limitations of the soils, the risks of damage to them, and their response to management. In this report, soils have been grouped on three levels above the soil mapping unit. They are the capability unit, the subclass, and the class.

The capability unit, which can also be called a management group of soils, is the lowest level of capability grouping. A capability unit is made up of soils similar in management needs, in risk of damage, and in general suitability for use.

The next broader grouping, the subclass, is used to indicate the dominant kind of limitation. The letter symbol "e" means that the main limiting factor is risk of erosion if the plant cover is not maintained. The symbol "w" means that excess water retards plant growth or interferes with cultivation. The symbol "s" means that the soils are shallow, stony, sandy, droughty, or low in fertility.

The broadest grouping, the class, is identified by Roman numerals. All of the soils in one class have limitations or hazards of about the same degree, but of different kinds as shown by the subclass. Any class except class I may have one or more subclasses.

In classes I, II, and III are soils that are suitable for annual or periodic cultivation of annual or short-lived crops.

Class I soils are those that have the widest range of use and the least risk of damage. They are level or nearly level, productive, well drained, and easy to work. They can be cultivated with almost no risk of erosion and will remain productive if managed with normal care. Frederick County has more than 18,000 acres of such soils—about 4.3 percent of the county area.

Class II soils can be cultivated regularly, but they do not have quite so wide a range of suitability as class I soils. Some class II soils are gently sloping and consequently need moderate care to prevent erosion. Other soils in class II may be slightly droughty, slightly wet, somewhat limited in depth, or somewhat low in fertility. Almost one-third of Frederick County is occupied by soils of Class II. They cover nearly 145,000 acres.

Class III soils can be cropped regularly, but they have a narrower range of use. Their limitations of erosion hazard, wetness, or droughtiness make more careful management necessary. More than 95,000 acres, a little more than 22 percent of the county, is covered by class III soils. Properly managed and conserved, they make good farmland; carelessly managed, they will deteriorate and go out of production.

In class IV are soils that should be cultivated only occasionally or only under very careful management. These are marginal soils, easily lost to production if mismanaged. Careful conservation is needed to keep them contributing to the agriculture of the county. Only 8.2 percent of Frederick County, not quite 35,000 acres, is in class IV.

In classes V, VI, and VII are soils that normally should not be cultivated for annual or short-lived crops but can be used for pasture, for woodland, or for wildlife shelter.

Class V soils are nearly level and gently sloping,

but they are droughty, wet, subject to damaging overflow, low in fertility, or otherwise unsuitable for cultivation.

Class VI soils are not suitable for regularly cultivated crops because they are steep, droughty, wet, or otherwise limited. They are best suited for growing trees or pasture. They give fair to high yields of forage and fair to high yields of forest products. Some soils in class VI can, without damage, be cultivated enough so that fruit trees or forest trees can be set out or pasture crops seeded. Nearly 73,000 acres—about 17.3 percent of the county—consists of class VI soils.

Class VII soils have characteristics that severely limit their use for pasture and, in some places, for woodland. Yields of forest products may be fair to high. About 14 percent of the county is in this class, which is really suitable only for forestry. If the class VII soils are properly used, Frederick County will always have nearly 60,000 acres of forest, even if all other soils of the county are put to the most intensive use for which they are suitable.

In class VIII are soils that have practically no agricultural use. None of the soils in Frederick County are in class VIII.

The soils of Frederick County have been grouped into the following classes, subclasses, and units. The numbers of the units are not consecutive because they are part of a State-wide system of capability grouping, not all units of which are represented in Frederick County.

Class I.—Soils that have few limitations that restrict their use.
- Unit I-1.—Deep, well-drained, nearly level soils developed from material high in lime.
- Unit I-4.—Deep, well-drained, nearly level soils developed from material low in lime.
- Unit I-6.—Deep, well-drained soils of the flood plains.

Class II.—Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.
- Subclass IIe.—Gently sloping soils, subject to erosion when tilled.
  - Unit IIe-1.—Gently sloping, deep, well-drained, moderately eroded soils developed from material high in lime.
  - Unit IIe-4.—Gently sloping, deep, well-drained, moderately eroded soils developed from material low in lime.
  - Unit IIe-5.—Gently sloping, coarse-textured soils that have sandy subsoils.
  - Unit IIe-10.—Level to sloping, shallow soils developed from material low in lime.
  - Unit IIe-14.—Sloping soils that developed from material high in lime and have impeded drainage.
  - Unit IIe-24.—Sloping soils developed from calcareous schists; very highly erodible.
  - Unit IIe-25.—Shallow to moderately deep, well-drained soils of hills and mountains.
- Subclass IIw.—Moderately wet soils.
  - Unit IIw-1.—Level to gently sloping soils that developed from material low in lime and have impeded drainage.
  - Unit IIw-2.—Nearly level soils that developed from material high in lime and have impeded drainage.

Class III.—Soils that have severe limitations that reduce the choice of plants or require special conservation practices, or both.
- Subclass IIIe.—Sloping soils that have high risk of erosion when tilled.
  - Unit IIIe-1.—Rolling, deep, well-drained soils developed from material high in lime.
  - Unit IIIe-4.—Rolling, deep, well-drained soils developed from material low in lime.
  - Unit IIIe-5.—Rolling, coarse-textured soils that have sandy subsoils.
  - Unit IIIe-10.—Sloping to rolling, shallow soils developed from material low in lime.
  - Unit IIIe-13.—Gently to strongly sloping soils that developed from material low in lime and have tight subsoils.
  - Unit IIIe-24.—Rolling soils developed from calcareous schists; very highly erodible.
  - Unit IIIe-25.—Rolling, shallow to moderately deep, well-drained soils of hills and mountains.
  - Unit IIIe-30.—Shallow, well-drained, fine-textured soils.
  - Unit IIIe-40.—Level to rolling, shallow, droughty soils.
- Subclass IIIw.—Wet soils that require artificial drainage if they are tilled.
  - Unit IIIw-1.—Poorly drained flood-plain soils developed from material high in lime.
  - Unit IIIw-11.—Nearly level soils that developed from material low in lime and have very tight subsoils.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.
- Subclass IVe.—Soils severely limited by risk of erosion when tilled.
  - Unit IVe-1.—Rolling to hilly, deep, well-drained soils developed from material high in lime.
  - Unit IVe-3.—Rolling to hilly, deep, well-drained soils developed from material low in lime.
  - Unit IVe-10.—Rolling to hilly, eroded, shallow soils developed from material low in lime.
  - Unit IVe-25.—Hilly, shallow to moderately deep, well-drained soils of hills and mountains.
  - Unit IVe-41.—Severely eroded, shallow soils that have tight subsoils.

Class V.—Soils that have little or no erosion hazard but have other limitations that are impractical to remove that limit their use largely to pasture, woodland, or wildlife food and cover.
- Subclass Vw.—Soils limited by severe overflow hazard.
  - Unit Vw-1.—Moderately well drained to somewhat poorly drained soils on flood plains, subject to very frequent damaging overflow.
  - Unit Vw-2.—Poorly drained soils of upland depressions.

Class VI.—Soils that have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, woodland, or wildlife food and cover.
- Subclass VIe.—Soils moderately limited for pasture or trees by risk of erosion if cover is not maintained.
  - Unit VIe-2.—Rolling and severely eroded to steep and moderately eroded, fairly deep soils developed from material low in lime.
  - Unit VIe-3.—Rolling and very severely eroded to steep and moderately eroded, shallow soils developed from material low in lime.
- Subclass VIw.—Soils severely limited by poor drainage.
  - Unit VIw-1.—Poorly drained soils on flood plains subject to very frequent damaging overflow, developed from material low in lime.
- Subclass VIs.—Soils severely limited by stones and outcrops of rock.
  - Unit VIs-1.—Rocky soils with limestone outcrops.
  - Unit VIs-2.—Nearly level to rolling, stony soils developed from material low in lime.

Class VII.—Soils that have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture, woodland, or wildlife shelter.
- Subclass VIIe.—Soils limited by risk of erosion if cover is not maintained.
  - Unit VIIe-1.—Hilly, severely eroded, rocky soils with many limestone outcrops.
  - Unit VIIe-3.—Rolling to very steep, shallow soils that are generally severely eroded.
- Subclass VIIs.—Soils severely limited by stones and rockiness.
  - Unit VIIs-2.—Very shallow and droughty, very stony soils.
  - Unit VIIs-3.—Rolling to very steep soils with abundant stones and rock outcrops, a few severely eroded.
  - Unit VIIs-4.—Very stony, poorly drained soils of upland depressions.

In the following pages each capability unit is described briefly, the soils in each are listed, and some suggestions for the use and management of those soils are given.

Capability Unit I–1

This unit consists of deep, well-drained, nearly level soils developed from material high in lime. It consists of 7,088 acres, or about 1.7 percent of the county. The soils occupy the more nearly level areas scattered through the limestone valley from near Woodsboro south-southwestward through the city of Frederick and to the Potomac River near Licksville.

The soils in this unit are—

Athol gravelly loam, 0 to 3 percent slopes.
Duffield silt loam, 0 to 3 percent slopes.
Elk loam, 0 to 3 percent slopes.
Hagerstown gravelly loam, 0 to 3 percent slopes.
Hagerstown loam, 0 to 3 percent slopes.
Hagerstown silt loam, 0 to 3 percent slopes.
Huntington silt loam, local alluvium, 0 to 3 percent slopes.

These soils have thick, friable surface layers of generally medium texture. Some of them are gravelly or slightly shaly, but this does not interfere with cultivation or lessen their productivity. There is little danger of erosion.

All of these soils are highly productive. They have the highest natural fertility of any group of soils in the county. They are well supplied with plant nutrients and organic matter. They need less lime for common crops than other county soils.

These soils are well suited to almost all crops common to the county. They are not suited to fruit trees, because the air drainage is rather poor in most locations. These are excellent soils for pasture.

Except for a few hundred acres of urban development in and around the city of Frederick, practically all of this unit has been cleared and is used for crops or pasture. A small area west of Buckeystown is still in forest, and there are scattered small home woodlots. Dairy farming is especially concentrated on soils of this capability unit.

The most important single crop is corn, most of which is fed as grain or silage to dairy cattle. Some of the soils are kept almost continuously in corn, but 3-year or 4-year rotations are more common. Corn or some other row crop is followed by wheat, barley, or winter oats, then by 1 or 2 years of red clover or mixed hay or 2 years of alfalfa. The hay is usually a mixture of clover and timothy or of clover and orchardgrass, or of all three.

Some fields are kept in alfalfa for 3 to 5 years, then used for corn for 1 or 2 years, and then planted to alfalfa again. Some sweet corn and considerable soybean hay is grown.

Pasture is more likely to be on less valuable soils, but these soils support some excellent pasture. Bluegrass and clover are the most common pasture plants, but timothy, orchardgrass, and brome are sometimes used.

Limestone is commonly applied to these soils, but less is needed than for most other soils of the county. Fertilizers, especially phosphates and potash, and barnyard manure are used on nearly all fields.

Yields are good, but they could probably be increased at least 40 percent by intensified good management.

Keeping these soils in a good rotation or in hay or pasture is usually the only conservation measure needed. There is practically no fertility problem, no drainage problem, and very little danger of erosion. Long slopes should be farmed in field strips at right angles to the slope. Long, curving slopes should be farmed in contour strips. If corn is grown almost every year, a winter cover crop, such as sweetclover, should always be grown between corn crops. The soils should be tested so that lime and fertilizer can be used most effectively.

Capability Unit I–4

This unit consists of deep, well-drained, nearly level soils developed from material low in lime. These soils are similar to the soils in capability unit I-1, except that they were not derived from nor influenced by limestone, and they are less productive. They lie in rather small, nearly level areas on flat ridgetops among sloping to hilly soils. They are scattered throughout the county, but about one-half of the total area is in the Middletown Valley. The total area is 5,379 acres, or about 1.3 percent of the county.

The soils in this unit are—

Birdsboro silt loam, 0 to 3 percent slopes.
Bucks silt loam, 0 to 3 percent slopes.
Chester loam, 0 to 3 percent slopes, moderately eroded.
Congaree silt loam, local alluvium, 0 to 3 percent slopes.
Elioak silt loam, 0 to 3 percent slopes, moderately eroded.
Fauquier gravelly loam, 0 to 3 percent slopes.
Fauquier loam, 0 to 3 percent slopes.
Fauquier silt loam, 0 to 3 percent slopes.
Glenelg and Chester silt loams, 0 to 3 percent slopes, moderately eroded.
Myersville and Fauquier gravelly loams, 0 to 3 percent slopes.
Myersville and Fauquier loams, 0 to 3 percent slopes.
Myersville and Fauquier silt loams, 0 to 3 percent slopes.
Norton gravelly silt loam, 0 to 3 percent slopes.
Thurmont silt loam, 0 to 3 percent slopes.

Fertility is moderate to rather high, but these soils have greater need for lime and fertilizer than the soils of unit I–1. Except for potash, the supply of plant nutrients in these soils is less than the supply in the soils of capability unit I–1.

These soils are suitable for practically all of the upland crops of the area. Because they are nearly level, they do not have very good air drainage for orchards. They make excellent pasture. They may require somewhat more careful management than soils of capability unit I–1, because they are slightly less fertile.

The soils of capability unit I–4 are used for all the common crops of the county and for high-quality pasture. Only a few woodlots and other small tracts of forest remain; the rest of the acreage has been cleared. The same crops are grown as on the soils of unit I–1, but there is less emphasis on dairying. Only a small part of the area is in continuous corn.

Nearly all the cultivated soils in this unit are managed in a 3-year rotation. Corn is followed by winter wheat, barley, or oats, and this is followed by 1 year of red clover or mixed hay. Red clover is the most common, and the sod is turned under immediately before corn is planted again. The rotations can be 4 or 5 years long if alfalfa or a similar crop occupies the land for 3 or more years.

Under the present management, yields on the soils of capability unit I–4 are fairly high, but they could be improved considerably by more careful management. Yields are not so high as those on the soils of capability unit I–1.

The unit I–4 soils occur in small patches, seldom covering an entire field, and their management is commonly determined by the management required for the surrounding soils. These surrounding soils may belong to almost any of the other units, but most of them are in capability unit IIe–4. Unit IIe–4 consists of the same kind of soils as unit I–4, but they are on stronger slopes, or have had more erosion, or both. The management will include contour tillage or contour stripcropping on slopes, and field strips on nearly level areas. Special attention should be paid to the diversion and disposal of runoff water on contour-tilled slopes.

Capability Unit I–6

This unit consists of deep, well-drained, nearly level soils on flood plains of streams throughout the county. They cover 6,329 acres, or 1.5 percent of the county. The largest areas are along the Potomac River, the Monocacy River, and Catoctin Creek. Narrow strips of these soils lie along the smaller streams.

The soils in this unit are—

Bermudian fine sandy loam, 0 to 3 percent slopes.
Bermudian silt loam, 0 to 3 percent slopes.
Congaree silt loam, 0 to 3 percent slopes.
Huntington fine sandy loam, 0 to 3 percent slopes.
Huntington silt loam, 0 to 3 percent slopes.

These are deep soils, easily penetrated by roots. Moisture supplies are nearly always adequate. The Bermudian and Congaree soils are fairly fertile and respond well to good management. The Huntington soils are even more fertile and productive. These soils are flooded occasionally but not frequently.

These soils are well suited to most common crops and to pasture. The best suited crops are corn, soybeans, clovers, and mixtures of bluegrass and whiteclover. Alfalfa and small grains are sometimes successful, but the danger of flooding is ordinarily too great.

Corn and hay are the principal crops. Corn is grown year after year, sometimes with a cover crop between seasons. Soybeans are grown for hay, usually following corn. Mixed hay is common. It may be grazed part of the time, or it may be grown a year or more for hay and then used for pasture. Some sweet corn is grown. Small grains are not commonly planted, because of the danger of some flooding in winter or early in spring and of lodging. Bluegrass and whiteclover are the most common pasture plants.

The average productivity of these soils is very high. In spite of the intervals of flooding or excessive wetness, well-managed pastures, especially on the Huntington silt loam, have the highest carrying capacity of any pastures in the county. In good seasons, some excellent small-grain crops are produced, particularly barley on the Congaree silt loam, 0 to 3 percent slopes. The sandier soils in this group may be slightly less productive.

Many areas of these soils are in such small strips along streams that management as separate fields is not practical. The management of these small areas is usually determined by the management of the upland fields next to them.

Fertilizers and lime should be used as indicated by soil testing. Usually they are necessary only on corn, either in rotation or as a continuous crop. Animal manure is valuable for corn.

Weeds in pastures must be controlled. Mowing of weeds at intervals is most important. Proper fertilization and carefully regulated grazing help to improve pastures. When the soils are flooded or wet, animals should be kept out to avoid trampling and compacting the soil, puddling of the surface, and loss of good forage.

Capability Unit IIe–1

This unit consists of gently sloping, deep, well-drained soils developed from material that was high in lime. They are moderately eroded. At least two-thirds of all the soils in the limestone valley area of Frederick County belong to this capability unit. The total acreage is 30,563 acres, or about 7.1 percent of the entire county area. About half of this acreage consists of Duffield and Frankstown soils.

The soils in this unit are—

Athol gravelly loam, 3 to 8 percent slopes, moderately eroded.

Duffield and Frankstown shaly silt loams, 0 to 3 percent slopes, moderately eroded.
Duffield and Frankstown shaly silt loams, 3 to 8 percent slopes, moderately eroded.
Duffield and Frankstown silt loams, 0 to 3 percent slopes.
Duffield and Frankstown silt loams, 3 to 8 percent slopes, moderately eroded.
Elk gravelly loam, 3 to 8 percent slopes, moderately eroded.
Elk loam, 3 to 8 percent slopes, moderately eroded.
Hagerstown gravelly loam, 3 to 8 percent slopes, moderately eroded.
Hagerstown loam, 0 to 8 percent slopes, moderately eroded.
Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded.

These soils are deep, well drained, and easy to work. They are naturally fertile and highly productive. Because the slopes range up to 8 percent, there is always some hazard of erosion. The erosion problem is not serious under good management.

The soils of capability unit IIe–1 are suited to all common crops of the area. They are especially well suited to legumes such as alfalfa, redclover, and other clovers. Fruit trees generally are not grown on these areas because these soils are too valuable for grain and forage crops, but Athol gravelly loam, 3 to 8 percent slopes, moderately eroded, is well adapted to orchards.

Soils in this capability unit are used chiefly for corn, small grains, hay, and pasture, all grown in support of dairying. Corn and alfalfa are the chief crops. Rotations lasting 3 years or 4 years are common. Corn is grown for 1 year and followed by 2 or more years of alfalfa.

Small grains and hay take up most of the acreage, but some of the unit is in pasture. Most grazing is on bluegrass and clovers, or on temporary pasture after 1 or more years of hay. A considerable acreage of corn, soybeans, and other forage crops is grown for silage.

Yields of all crops are high under the prevailing management. Pastures are generally excellent. These soils are not quite so productive as the soils of capability unit I–1, but they are more important because they are so extensive.

Good management of these soils consists chiefly of maintenance of fertility and prevention of erosion. Soils should be limed and fertilized according to the results of soil tests. All manures and crop residues should be returned to the soil.

Erosion has not been serious and will not be a great hazard if contour tillage and stripcropping are practiced. In some places, runoff water should be diverted into natural drainageways, which should be kept fully sodded. The outlets of such drainageways should be well prepared and carefully maintained, to keep water from damaging the soil.

Capability Unit IIe–4

This unit consists of gently sloping, deep, well-drained soils that developed from various kinds of acidic rocks that were low in lime content. These soils are moderately eroded. They are like the soils in capability unit I–4, except that they are more sloping, more eroded, or both. There are 38,964 acres in the unit, or about 9.2 percent of the county area. Most of this is in the Middletown Valley, but some is in the eastern part of the county.

The soils in this unit are—

Birdsboro silt loam, 3 to 8 percent slopes, moderately eroded.
Braddock cobbly loam, 3 to 8 percent slopes.
Braddock gravelly loam, 3 to 8 percent slopes, moderately eroded.
Bucks silt loam, 3 to 8 percent slopes, moderately eroded.
Chester loam, 3 to 8 percent slopes, moderately eroded.
Congaree silt loam, local alluvium, 3 to 8 percent slopes.
Elioak gravelly loam, 3 to 8 percent slopes, moderately eroded.
Elioak silt loam, 3 to 8 percent slopes, moderately eroded.
Fauquier gravelly loam, 3 to 10 percent slopes, moderately eroded.
Fauquier loam, 3 to 8 percent slopes, moderately eroded.
Fauquier silt loam, 0 to 10 percent slopes, moderately eroded.
Glenelg gravelly loam, 0 to 8 percent slopes, moderately eroded.
Glenelg and Chester loams, 3 to 8 percent slopes, moderately eroded.
Glenelg and Chester silt loams, 3 to 8 percent slopes, moderately eroded.
Montalto silty clay loam, 0 to 8 percent slopes, moderately eroded.
Myersville and Fauquier gravelly loams, 3 to 8 percent slopes, moderately eroded.
Myersville and Fauquier loams, 3 to 8 percent slopes, moderately eroded.
Myersville and Fauquier silt loams, 3 to 8 percent slopes, moderately eroded.
Norton gravelly silt loam, 3 to 8 percent slopes, moderately eroded.
Waynesboro gravelly loam, 0 to 8 percent slopes, moderately eroded.

Most of the surface soils are medium in texture. Small areas of Montalto soils have a finer texture, and small areas of Braddock soils are cobbly. All of these surface soils are friable and easy to work when moist. Some of the sloping soils are moderately eroded. The erosion is not very serious, but it is more of a hazard than in capability unit I–4.

All of these soils are somewhat acid, except where they have been limed. All are at least moderately fertile; the Fauquier and Myersville soils are highly fertile. The soils in this capability unit are deep, well drained, and easy to conserve.

The soils of capability unit IIe–4 are suited to all crops of the county, including orchards. Most of the area is intensively farmed, and comparatively little is in forest or woodlots. Dairying is the main agricultural enterprise, but it is not so concentrated as on the soils of the limestone valleys. The pattern is one of general farming, with emphasis on corn, small grains, hay, and pasture. Apples and peaches are grown, especially on the Braddock soils near Thurmont and elsewhere on the lower eastern foot slopes of Catoctin Mountain.

The cropping system and rotations used on soils of this capability unit are like those used on soils of capability unit I–4. The most common rotation lasts 3 years, but if alfalfa is grown for 3 years or more, the rotation is extended to 5 or 6 years.

A larger proportion of these soils is used for pasture than of the class I or unit IIe–1 soils. The carrying capacity of pasture on these soils is usually rather high. Bluegrass-and-clover mixtures are most commonly used for grazing. Considerable hay is produced; it consists of alfalfa, redclover, soybeans, timothy, orchardgrass, bromegrass, or various mixtures of these plants.

These soils need more fertilizers and manure than do soils of the limestone valley region. These amendments, used according to the results of soil tests, will maintain productivity at a high level.

Slopes range up to 10 percent, and some of them are very long. Contour tillage and contour stripcropping, with very careful disposal of runoff water, are necessary. These practices, plus good rotations that keep a vegetative cover on the soil most of the time, can prevent or limit erosion damage.

Capability Unit IIe–5

This capability unit consists of gently sloping, coarse-textured soils that have sandy subsoils. In Frederick County this unit contains only one soil, Sequatchie sandy loam, neutral variant, 3 to 8 percent slopes, moderately eroded. There are only 415 acres, about one-tenth of 1 percent of the county. The soil is located on the old river terraces near Lime Kiln and Buckeystown.

The soil is sandy, but it has enough fine material in the surface layer to give it a loamy texture. In many places, however, the subsoil is almost pure sand. The soil is very easy to work and to maintain in good condition. It is not very likely to erode, because it is so readily permeable. It is somewhat droughty, but it has a good supply of plant nutrients, especially lime. The fertility is much higher than is typical of sandy soils, probably because the soil is underlain by limestone.

Deep-rooted crops do best on this soil, because they can draw moisture from the subsoil or even from the limestone substratum. Alfalfa does very well on this soil in spite of the droughtiness. Corn, followed by redclover or mixed hay for at least 2 years, or followed by alfalfa for 2 years or more, appears to be the best rotation. The soil is well suited to spring or fall vegetable crops. In midsummer, supplementary irrigation is necessary for truck crops.

Because it occurs in small areas, this soil is usually managed in conjunction with the surrounding soils, which are in most places soils of capability unit IIe–1. It is used for the crops common to the area, chiefly corn, alfalfa, other hay, and pasture. Very little small grain is grown. The usual rotation is corn, followed by 2 or more years of hay.

Conservation of moisture is the most serious management need. Cropping and tillage should be on the contour, to slow runoff and encourage percolation of water into the soil. The same practices will also check erosion, although erosion is not a serious hazard on this soil.

A covering of vegetation should be kept on this soil, especially during dry weather. Moderate winds tend to blow away part of the surface soil and leave the sandier and less fertile layers exposed.

Capability Unit IIe–10

This unit consists of level to sloping, shallow, very well drained soils that developed from parent material that was low in lime. This is the most extensive capability unit in the county. It covers 48,339 acres, about 11.4 percent of the county area. About half of this is in the Piedmont Plateau area of the eastern and southeastern parts of the county, and nearly half is in the red shale areas of the county.

The soils in this unit are—

Cardiff channery loam, 0 to 8 percent slopes, moderately eroded.
Catoctin channery silt loam, 0 to 10 percent slopes, moderately eroded.
Dekalb loam, 0 to 10 percent slopes, moderately eroded.
Edgemont-Chandler channery loams, 0 to 10 percent slopes, moderately eroded.
Manor channery and gravelly loams, 0 to 8 percent slopes, moderately eroded.
Penn gravelly loam, 0 to 8 percent slopes, moderately eroded.
Penn loam, 0 to 8 percent slopes, moderately eroded.
Penn silt loam, 0 to 8 percent slopes, moderately eroded.
Penn-Lansdale loams, 0 to 8 percent slopes, moderately eroded.

The average production from soils of this capability unit is lower than that from soils in capability class I. These soils are somewhat droughty during long dry periods. Some, such as Catoctin channery silt loam, 0 to 10 percent slopes, moderately eroded, have fairly high fertility. The Dekalb loam, 0 to 10 percent slopes, moderately eroded, has very low fertility. The fertility of the other soils of this capability unit ranges between these extremes.

These soils are suitable for most of the crops commonly grown in the county. They are used less intensively than the soils of capability units I–1 and IIe–1, but the general pattern of farming is similar. Most of the farms are dairies.

A 3-year rotation of corn, small grain, and hay is commonly used. If wheat or barley is part of the rotation, it is fall seeded after the corn. Hay is generally grown for only 1 year, because hayfields do not last well after the second year. Another common rotation is corn, followed by a winter cover of sweetclover, then spring oats, and then hay. When alfalfa is grown, it usually follows corn. It is kept for only 2 years on the Penn soils but for 3 or 4 years on the Manor and other soils of the Piedmont Plateau.

The most important and extensive soils of this capability unit, the Penn soils and the Manor soils, differ somewhat in productivity and management.

On the Penn soils, the farms are smaller than the average for the county. Grain and forage is grown for dairy cows, but there is less pasture per cow than in other sections of the county. On the Penn soils, alfalfa succeeds best when it is planted in the spring and becomes well rooted before the hot, dry summer weather. The Penn and Penn-Lansdale soils are not well suited to fruit trees, although many soils of this capability unit are well suited to apple and peach orchards.

On the Manor soils, the average farm is larger than those in most parts of the county, because the production per acre is less. A larger proportion of the Manor soils is in pasture. On the Manor soils, as on most soils in this capability unit, alfalfa is seeded after midsummer.

The mountain soils of this capability unit, the Dekalb and the Edgemont-Chandler soils, are the least productive for all crops. They are lower in fertility and more acid in reaction than the other soils of the unit. For these reasons, alfalfa is generally less suitable than grass mixtures for hay on these soils.

All of these soils need considerable fertilizer and lime. The amounts can be determined by testing the soil for acidity and for various plant nutrients. All available animal manures and plant residues should be returned to the soil. Legumes and cover crops should be used whenever possible.

Moisture-conserving practices are very important on these soils. Contour tillage and contour stripcropping are especially valuable in slowing runoff and preventing erosion. Wherever water concentrates, as at the outlets of natural waterways, it should be dispersed on sodded areas if possible.

Capability Unit IIe–14

These are sloping soils that have impeded drainage. They developed from material that was high in lime. Frederick County contains only 238 acres of soils in this capability unit, only a small fraction of 1 percent of the county area. The soils are in small areas along old river terraces and in sloping depressions.

The soils in this unit are—

Captina silt loam, 0 to 8 percent slopes, moderately eroded.
Lindside silt loam, local alluvium, 3 to 8 percent slopes.

These soils are easily worked when the moisture content is right. However, the tight subsoil slows percolation of water through the soil and causes the surface layer to be very wet at certain times. This increases the amount of runoff and the hazard of erosion. Fertility is moderate.

These soils can best be used for corn, hay, and pasture. Sweet corn should be a good crop. Clovers and tall grasses are best for hay. Orchardgrass, bromegrass, and tall fescue are well suited, but alfalfa is not so well suited to these soils.

Because these soils are in small areas, they are generally used for the same purposes as the surrounding soils. Corn is usually followed by wheat or barley and then by 1 or 2 years of redclover or mixed hay, or 2 years of alfalfa. Some soybeans are grown for hay. Where these soils are managed separately, they are commonly used for pasture. Most pastures are mixtures of bluegrass and whiteclover.

Yields of corn or pasture on soils of this capability unit are usually as good as or better than yields on the surrounding upland soils. Yields of most other crops are not so good on these soils as they are on the better drained soils nearby. The difference is slight, but it is noticeable when these soils are included in larger fields of other soils.

Although the use of these soils is generally determined by the use of the better drained soils around them, they should receive special management for diversion and removal of water, control of erosion, and fertilization.

Diversion terraces can be used to intercept runoff from higher land onto these soils. Open ditches or tile drains are necessary to drain water from the wettest spots. The practices that will control runoff and accumulation of water on these soils will also help control erosion. Livestock should not be allowed to trample pastures on these soils when they are very wet, to avoid puddling and compacting of the surface soil.

Fertility should be maintained by the addition of fertilizers and lime according to the results of soil tests. Phosphate fertilizer will probably be needed. Legumes should be used in the hay mixture or elsewhere in the rotation.

Capability Unit IIe–24

This capability unit consists of highly erodible, sloping soils that developed from calcareous schist. In Frederick County it contains only one soil, Conestoga silt loam, 0 to 8 percent slopes, moderately eroded. The 1,842 acres of this soil is only four-tenths of 1 percent of the county. This soil extends from the Carroll County line near Union Bridge southward nearly to the Old Annapolis Road.

This soil is in a separate capability unit because it is more easily eroded than most of the other deep, well-drained soils of the county. Otherwise it is much like the soils in capability unit IIe–1. It is a fertile soil, and under good management it is highly productive.

This soil is suitable for almost any crop common to the county, but it needs more careful management than most soils on similar slopes. Yields are generally very good. Soybeans and other crops that leave the soil bare or that loosen the surface should not be planted, even though they produce well, because they make the soil more susceptible to erosion. Alfalfa

is a good crop for this soil. These soils are suitable for orchards, but not many acres are used for this purpose at present.

Short rotations are commonly used on this soil. Because of the intense erosion hazard, these rotations should be longer and should include longer intervals of hay or other very close growing crops. At least 2 or 3 years of hay should follow corn and small grain. Alfalfa should be maintained for as long as it produces good yields.

All farming operations should be on the contour. Stripcropping is necessary, and it is easy to use because most areas of this soil are long and narrow, with the slope at right angles to the length of the strip. Great care should be taken to protect waterways from erosion, as such erosion easily creates gullies.

Capability Unit IIe–25

This capability unit consists of the least eroded soils on low mountains and high intermountain areas and some colluvial areas along mountain foot slopes. They are extensive, covering 10,383 acres, or 2.4 percent of the county, but they generally are not in large, continuous areas. They are more likely to lie along ridgetops or on the benches. Most areas are in the northwestern and north-central parts of the county, commonly near Foxville and in Harbaugh Valley. Small areas along the southern part of Catoctin Mountain, on mountain foot slopes near Thurmont, and a few small spots on smoother ridge crests of the Piedmont Plateau in the eastern part of the county also belong to this capability unit.

The soils in this unit are—

Chandler and Talladega channery loams, 0 to 10 percent slopes, moderately eroded.
Chandler and Talladega silt loams, 0 to 10 percent slopes, moderately eroded.
Edgemont gravelly loam, 0 to 8 percent slopes, moderately eroded.
Highfield channery loam, 0 to 10 percent slopes, moderately eroded.
Highfield silt loam, 0 to 10 percent slopes, moderately eroded.
Thurmont cobbly loam, 0 to 8 percent slopes.
Thurmont gravelly loam, 0 to 8 percent slopes, moderately eroded.
Thurmont gravelly and cobbly loams, 0 to 3 percent slopes.

These soils are level to sloping, shallow to moderately deep, and well drained. Some of them, especially the Chandler and Talladega soils along Catoctin Mountain, are shallow. Some of the Thurmont soils included in this unit are gravelly and cobbly. Other soils are deeper and more productive. The Highfield soils are the most fertile, but most soils of this capability unit are somewhat poorly to only moderately well supplied with plant nutrients. Soil tests are necessary to determine the extent of deficiencies. These soils are acid.

These soils are suitable for the crops common to the county. They are also good forest soils.

These areas are not used primarily for dairying, but rather for general crops. Some pasture is grown, but the emphasis is on crops for sale and on part-time farming. Strawberries, raspberries, vegetables, and tree fruits, especially peaches, are commonly grown, although the total acreage is not great. The center of poultry production in the county is on these soils. Many turkeys are raised. Much of the grain and alfalfa produced is fed to poultry. These soils have more acreage in forest than the soils of any other capability unit in classes I and II.

These soils erode easily if they are not protected. Runoff water must be controlled. Contour farming is necessary, and excess water should be disposed of carefully through sodded waterways that have adequate and safe outlets.

These soils should be kept under a cover of vegetation as much of the time as possible. In most places, corn and small grain should be followed in the rotation by 2 years of hay. On more level areas, 1 year of hay may be enough. If the hay crop is alfalfa, it should be continued for at least 3 years, particularly if the alfalfa follows directly after corn without an intervening crop of small grain. Peach or apple trees should be planted and cultivated on the contour, and the surface between should be kept in cover crops or sod most of the time.

Fertilizers and lime are needed to maintain fertility. A large proportion of the hay and cover crops should be legumes. Forests are a good crop on these soils.

Capability Unit IIw–1

This capability unit consists of level to gently sloping soils that have impeded drainage. They developed from material that was low in lime content. There are 6,374 acres altogether, or 1½ percent of the county area, but they are scattered in small areas in nearly all parts of the county. They consist of wet spots within other soils or of rather long, narrow strips along some of the streams and rivers. The Glenville soil is most common in the Piedmont Plateau area of the eastern part of the county, the Rohrersville soil in the Middletown Valley, and the Augusta soils along mountain foot slopes and terraces.

The soils in this unit are—

Augusta gravelly loam, 0 to 3 percent slopes.
Augusta silt loam, 0 to 8 percent slopes.
Glenville silt loam, 0 to 8 percent slopes.
Raritan silt loam, 0 to 3 percent slopes.
Rohrersville silt loam, 0 to 8 percent slopes.

In soils of this capability unit, the subsoil is so heavy or so tight, or both, that drainage is impeded. This keeps the soils very wet for considerable periods. In the areas that are level or depressed, fine material washed in from surrounding soils is likely to accumulate on the surface. Most of these soils have fairly low fertility, but the Rohrersville soil is a little more fertile and productive than the others.

Corn, hay, and pasture are the most suitable crops. Water-tolerant plants, such as alsike clover, white clover, and tall fescue, should be used for hay and pasture. Alfalfa is not suited to these soils, because

the drainage is so poor, and because of frost heaving in the winter.

The most common cropping systems on soils of this capability unit are continuous corn, or corn followed by hay for 1 or more years. Small grains are usually not included in the rotation.

The greatest problem on soils of this capability unit is the improvement of drainage. Most of the soils occur in low spots or depressions, and runoff from higher areas should be led around and away from them by diversion terraces. Excess water should be removed from the wettest spots by open ditches or by tile drains.

These soils cannot be cultivated when they are wet. Livestock should not be allowed to graze them when the surface is wet, as the soil will be trampled, puddled, and compacted. Rest periods during wet weather will allow a good sod to be maintained. Weeds and sedges commonly invade these pastures and should be controlled by mowing.

Erosion is not much of a problem in most places. The measures taken to improve the drainage will probably prevent erosion also. Fertilizers and lime will be needed for maximum productivity.

Capability Unit IIw–2

This capability unit consists of nearly level soils that have impeded drainage and that developed from parent material high in lime. They occupy only 2,958 acres, or seven-tenths of 1 percent of this county. They occur in relatively small spots, but normally they are not in depressions.

The soils in this capability unit are—

Colbert silt loam, deep variant, 0 to 3 percent slopes.
Lindside silt loam, local alluvium, 0 to 3 percent slopes.

A tight or slowly permeable subsoil is characteristic of these soils. During wet seasons they are very wet, and during dry seasons they are droughty and very tough. They are much like the soils of capability unit IIw–1, except that their limestone origin gives them higher natural fertility and higher productivity.

These soils appear to be suitable for many crops, but they are used almost entirely for corn, hay, and pasture. Separate management is not practical on these small areas. The Colbert soil is commonly used for pasture and not cultivated. The Lindside soil is usually managed like the surrounding better drained soils. Corn is grown continuously, or it is followed by hay that is pastured before corn is planted again.

These soils should be managed like the soils of capability unit IIw–1. They require less liming and less fertilization. Drainage is less of a problem, but these soils do need diversion terraces, drainage ditches, and tile drains to remove the excess water.

Erosion is not a serious hazard. It can be prevented by the same methods as those used to dispose of excess water.

Capability Unit IIIe–1

This capability unit consists of deep, well-drained soils on rolling topography. They developed from material that was high in lime. These soils are much like those in capability units I–1 and IIe–1, but they occur on stronger slopes.

In the limestone valley section where these soils are located, they cover about 1 acre in 11. They total 4,164 acres, which is about 1 percent of the county. Most of them occur in small areas of short steep slopes within more gently sloping fields.

The soils in this unit are—

Athol gravelly loam, 8 to 15 percent slopes, moderately eroded.
Duffield and Frankstown shaly silt loams, 8 to 15 percent slopes, moderately eroded.
Duffield and Frankstown silt loams, 8 to 15 percent slopes, moderately eroded.
Elk loam, 8 to 15 percent slopes, moderately eroded.
Hagerstown gravelly loam, 8 to 15 percent slopes, moderately eroded.
Hagerstown loam, 8 to 15 percent slopes, moderately eroded.
Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded.

Corn, small grains, hay, and pasture are commonly grown on these soils. Almost no forest is left. A somewhat larger proportion of these soils is in pasture than of the surrounding less sloping soils.

These soils are usually managed along with the less sloping soils of capability unit I–1 and IIe–1, but they need more intensive management to maintain their productivity and protect them from erosion. They need longer rotations, fewer years of clean-tilled crops, narrower field strips, and more careful disposal of water.

These soils are suitable for cultivation in regular rotations, but they should not be cultivated oftener than 2 years in 5. A rotation of corn, small grain, and 3 years of hay is suitable. It is better if the hay can continue for 4 or more years. The typical 3-year rotation of corn, small grain, and hay does not keep the soils covered enough of the time to protect them against erosion. Alfalfa is a good crop for these soils, and a considerable area is used for it.

Yields are good on these soils under proper management, but they average lower than on the soils of capability units I–1 and IIe–1. Yields are higher than on other soils in class III.

Crops should be grown on these soils in comparatively narrow field strips on the contour. The width of the strips should be much less on the steeper or eroded slopes.

Safe disposal of runoff is very important on these soils. Drainageways must be carefully and heavily sodded, must receive careful and frequent maintenance, and must have durable and safe outlets for the water.

The fertility of these soils should be improved by use of fertilizers and lime where needed.

Capability Unit IIIe–4

This unit consists of deep, well-drained soils on rolling topography. They developed from materials that were low in lime. These soils are like the soils in capability units I–4 and IIe–4, except that they are on stronger slopes and therefore need more careful

management and protection for maximum safe production.

About 5.6 percent of the entire county, or 23,805 acres, is in this capability unit. Many individual areas are rather small, but some occupy entire fields. These soils are common in the Piedmont Plateau area and in the Middletown Valley.

The soils in this unit are—

Braddock gravelly and cobbly loams, 8 to 15 percent slopes, moderately eroded.
Chester loam, 8 to 15 percent slopes, moderately eroded.
Elioak gravelly loam, 8 to 15 percent slopes, moderately eroded.
Fauquier gravelly loam, 10 to 20 percent slopes, moderately eroded.
Fauquier loam, 8 to 15 percent slopes, moderately eroded.
Fauquier silt loam, 10 to 20 percent slopes, moderately eroded.
Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded.
Glenelg and Chester loams, 8 to 15 percent slopes, moderately eroded.
Glenelg and Chester silt loams, 8 to 15 percent slopes, moderately eroded.
Montalto silty clay loam, 8 to 15 percent slopes, moderately eroded.
Myersville and Fauquier gravelly loams, 8 to 15 percent slopes, moderately eroded.
Myersville and Fauquier loams, 8 to 15 percent slopes, moderately eroded.
Myersville and Fauquier silt loams, 8 to 15 percent slopes, moderately eroded.
Norton gravelly silt loam, 8 to 15 percent slopes, moderately eroded.
Waynesboro gravelly loam, 8 to 15 percent slopes, moderately eroded.

These soils are suitable for cultivated crops, but they should not be clean-tilled, except in long rotations and under very careful management. Most of the land should be in hay or pasture. These are good soils for orchards.

Corn, small grains, hay, pasture, and orchards are commonly grown on these soils. Farmers emphasize dairying less and general farm crops more than farmers on the soils of capability unit IIIe–1 in the limestone valley area. A larger proportion of this unit than of unit IIe–4 is in hay, pasture, and orchards.

A 3-year rotation of corn, small grain, and 1 year of hay is common, but it is not very effective in protecting the soil. Yields are good, but to achieve good production with maximum protection of these soils, it is very important to use longer rotations. A 5-year rotation, with at least 3 of the 5 years in hay would be good, and a longer rotation would be better. A 4-year rotation that includes 2 years of hay would be better than the 3-year rotation now used in many places. Pastures of bluegrass and clover, redclover, mixed hay, or alfalfa should be on these soils for a larger proportion of the time than is now customary.

Contour tillage and contour stripcropping are necessary on these soils. The crop strips must be narrower than those on less sloping soils. Diversion terraces are needed in some places.

The ground should be broken only when absolutely necessary for farming operations. The plowed land should be left in rough contour furrows if it is to remain unplanted for any long period. Winter cover crops are important between regular crops.

These slopes have considerable runoff and danger of erosion. The surface water must be disposed of carefully and the soil protected for as much of the time as possible. All natural drainageways must be protected from erosion. They should be covered with heavy sod and carefully maintained.

Most areas in this capability unit are moderately eroded. Those on similar slopes that have been more severely eroded have lost more of their productivity and their suitability for crops and are now in capability classes IV, VI, or VII.

Maintenance of fertility is difficult on these soils because plant nutrients are lost by erosion. The soil should be tested and the proper elements added. All available animal manures, green-manure crops, and plant residues should be used.

Capability Unit IIIe–5

This capability unit contains one soil, which is coarse textured, has a sandy subsoil, and is on rolling topography. This is Sequatchie sandy loam, neutral variant, 8 to 15 percent slopes, moderately eroded. It is like the soil in capability unit IIe–5, except that it is on steeper slopes.

Only 164 acres of the county are in this capability unit. Nearly all of it is north of Lime Kiln, mostly along Cemetery Road.

This soil is sandy, and its subsoil is very sandy. The depth to the underlying limestone varies considerably. Outcrops of the limestone are common. Drainage is somewhat excessive, and this makes the soil droughty in midsummer. The soil is very easily worked. Fertility is moderate.

This soil is most commonly used for hay and for smaller amounts of corn and small grain. There is some pasture, but most of it has not been improved or maintained and is rather poor. Hay is better suited to this soil than pastures and is more generally grown.

Corn, followed by 2 to 4 years of hay, is a good rotation on this soil. Rotations can include a small grain. Vegetable crops will do well, especially if they are harvested before summer droughts or if they are irrigated.

Fertilizers are very necessary on this soil, especially for vegetables or alfalfa. The amount and kind of fertilizers needed can be determined by soil tests. Some lime may be needed also.

Contour tillage and contour stripcropping should be used to conserve and control water. Water-conserving terraces would be helpful in some fields. Because of the danger of wind erosion, this soil should be plowed only while moist, and fields should be left rough and trashy if they are not to be planted immediately.

The soil in this unit and that in capability unit IIe–5 are in some places used for sand pits. The sand is not of particularly high grade, but it is used for construction work.

Capability Unit IIIe–10

The soils in this capability unit are sloping to rolling, eroded, shallow soils from parent materials

that were low in lime. This is the most extensive unit in class III; it contains 30,517 acres, or about 7.2 percent of the county.

The soils in this unit are—

Cardiff channery loam, 8 to 15 percent slopes, moderately eroded.
Catoctin channery silt loam, 10 to 20 percent slopes, moderately eroded.
Dekalb loam, 10 to 20 percent slopes, moderately eroded.
Edgemont-Chandler channery loams, 10 to 20 percent slopes, moderately eroded.
Manor channery and gravelly loams, 8 to 15 percent slopes, moderately eroded.
Penn gravelly loam, 0 to 8 percent slopes, severely eroded.
Penn gravelly loam, 8 to 15 percent slopes, moderately eroded.
Penn loam, 8 to 15 percent slopes, moderately eroded.
Penn silt loam, 3 to 8 percent slopes, severely eroded.
Penn silt loam, 8 to 15 percent slopes, moderately eroded.
Penn-Lansdale loams, 8 to 15 percent slopes, moderately eroded.

These soils are generally similar to the soils in capability unit IIe–10. The more gently sloping soils in this unit are severely eroded. They have lost so much of their surface soil that the former subsoil is now exposed. This subsoil material is mixed with varying amounts of shale, gravel, or both. The steeper soils of this unit are not so severely eroded, but they have considerable hazard of further erosion.

The moisture-supplying capacity of some of these soils is moderate, but for most of the soils it is low. The severely eroded soils are especially droughty.

All of the soils in this unit have lost much of their productivity through erosion, and their present yields are very low. Although the productivity can be nearly doubled on many of these soils by intensive good management, the yields would still not be very high. Fertility is low in many places and only moderate in the others.

These soils are generally suitable for all of the commonly grown crops, but clean-cultivated crops cannot be grown regularly without severe damage to the soils. Hay and pasture are good crops for these soils. It would be very difficult to establish or maintain a stand of alfalfa on the Dekalb and Edgemont-Chandler soils because of their low fertility and extremely strong acidity. The Penn and Penn-Lansdale soils are not suitable for orchards.

Rotations must be long to prevent erosion damage. A 3-year rotation of corn, small grain, and hay is common, but a more suitable rotation would last 4 or 5 years, with at least 3 years in hay or pasture.

All tillage and other farming operations should be on the contour. Stripcropping should be in fairly narrow strips. Water-conserving terraces should be built in some places. Runoff water ought to be spread across meadow strips if possible, so that it will be absorbed into the soil. Water that does run off should be channeled through well-protected drainageways and outlets.

Green-manure and cover crops are especially valuable to the soils in this capability unit. They help to control erosion and to maintain or increase fertility. All available animal manures and crop residues should be used.

Lime and fertilizers can increase the productivity of these soils considerably. Soil tests will determine the amounts necessary.

Pastures must not be overgrazed on these soils, or they will erode seriously. The sod should be well established before grazing is permitted. Weed control is important, but it can be taken care of by seasonal mowing. If the soils have been properly limed and fertilized, good clover, bluegrass, and mixed pastures can be grown, as well as grass hay and mixed hay. Alfalfa can be grown on some of these soils.

Capability Unit IIIe–13

This capability unit consists of gently sloping to strongly sloping soils that are imperfectly drained to rather poorly drained because they have tight subsoils. They developed from materials that were low in lime.

There are 8,271 acres of this capability unit in Frederick County, about 1.9 percent of the county. The Urbana soil covers a large proportion of this area. The soils of this capability unit occur in small spots scattered through all of the county except the limestone valley area.

The soils in this unit are—

Augusta gravelly loam, 3 to 15 percent slopes, moderately eroded.
Chalfont silt loam, 3 to 15 percent slopes.
Glenville silt loam, 3 to 8 percent slopes, moderately eroded.
Lehigh slaty loam, 3 to 15 percent slopes, moderately eroded.
Raritan silt loam, 3 to 8 percent slopes, moderately eroded.
Readington silt loam, 0 to 8 percent slopes, moderately eroded.
Rohrersville silt loam, 3 to 15 percent slopes, moderately eroded.
Urbana silt loam, 3 to 15 percent slopes, moderately eroded.

All of these soils have impeded drainage. They are sloping enough, however, that the danger of further erosion is a more serious problem than the excess water. They are not easy to work. The fertility is neither extremely low nor high. The productivity is rather low, and even under the best management it would not be very high.

Nearly all of this capability unit is used for mixed hay or pasture. Clovers are mixed with orchardgrass in hay, and with bluegrass in pastures. Some corn is grown, but very little wheat, barley, or oats. These soils are poorly suited to vegetable crops or orchards.

These soils can all be cultivated, but a great deal of care is needed in management. Crops used must be able to tolerate extreme wetness in the spring and after rains and extreme dryness in midsummer. The soils should be plowed or cultivated only at long intervals. Generally, the less the surface is disturbed, the better. No machinery should be used, and no grazing should be permitted when the surface soil is saturated with water, because it will puddle and become even more difficult to drain and to manage.

Prevention of erosion and improvement of drainage are both necessary on these soils. Runoff from higher land nearby should be intercepted and diverted around these areas if possible. If it cannot be diverted, the water should be led through these areas by strongly sodded drainage strips. Some very wet spots and some more nearly level spots can be partly drained

by open V-type ditches. Tile drains are not suitable because the subsoil is too heavy and tight for good drainage into tiles and because most of these soils are not deep enough for a good tile drainage system. Contour tillage and stripcropping can be used on the steeper areas to control runoff.

These soils should be tested, and proper amounts of lime and fertilizer should be added to improve their productivity.

Capability Unit IIIe–24

This unit consists of very highly erodible soils that developed from calcareous micaceous schist on rolling topography. Only one soil, Conestoga silt loam, 8 to 15 percent slopes, moderately eroded, has been placed in this capability unit in Frederick County. It is like Conestoga silt loam, 0 to 8 percent slopes, moderately eroded, which is in capability unit IIe–24, except that this soil is steeper, is more likely to erode, and requires more intensive management. Only 773 acres, or about one-tenth of 1 percent of the county, is in this capability unit.

This soil is deep and well drained. It is more fertile and productive than most of the other soils in the Piedmont Plateau area, but it is not so fertile or productive as the soils on similar topography in the limestone valley area. It is more easily eroded than the soils of the limestone valley and most of the soils of the Piedmont Plateau.

This soil is suitable for practically all of the common crops if properly managed. Corn, small grain, and hay are generally planted in rotations lasting 4 or 5 years. Considerable areas are used for alfalfa. Orchards would do well on this soil, but none are grown at present.

Erosion is the most important management problem on this soil. Long rotations are necessary. Stripcropping should be done in very narrow strips. All drainageways should be kept in heavy sod. Tall fescue should make good sod for this purpose, and it could also be mowed for hay. Outlets for discharge of runoff should be especially carefully prepared to prevent breakthrough and gullying.

Fertility is not a serious problem where a good rotation and enough fertilizers have been used. Maintenance of high fertility will help to control erosion by establishing stronger sod to slow runoff.

Capability Unit IIIe–25

This capability unit consists of shallow to moderately deep, well-drained, rolling soils on hills and mountains. They are similar to the soils in capability unit IIe–25, except that they lie on steeper slopes. There are 8,239 acres of this unit, mostly in the northwestern part of the county between Ellerton and Blue Ridge Summit. Smaller areas are located on the slopes of South Mountain and Catoctin Mountain, and a few areas are scattered at higher elevations in the Piedmont Plateau area. Altogether they make up about 2 percent of the county.

The soils of this unit are—

- Chandler and Talladega channery loams, 10 to 20 percent slopes, moderately eroded.
- Chandler and Talladega silt loams, 10 to 20 percent slopes, moderately eroded.
- Edgemont gravelly loam, 8 to 15 percent slopes, moderately eroded.
- Highfield channery loam, 10 to 20 percent slopes, moderately eroded.
- Highfield silt loam, 10 to 20 percent slopes, moderately eroded.
- Thurmont gravelly loam, 8 to 15 percent slopes, moderately eroded.

These are fairly good soils, but they cannot be used safely for intensive cropping unless they are very carefully managed. They are suitable for hay, pasture, or forest. They are now used mainly for general farming, peach and apple orchards, fruit and berries, some truck crops, and considerable poultry, especially turkeys. There is little dairying in this area. A fairly large part of this capability unit is in forest.

Rotations should be longer on these soils. Hay or other close-growing crops should occupy the land for at least 3 years of the rotation. Some small odd areas would be best kept in continuous hay. They should be plowed and reseeded only when production lags or the surface becomes sodbound. Permanent pasture is another good use for these soils.

All tillage should be on the contour, within contour strips. The excess water from the strips should be disposed of very carefully, because some of these soils, especially the Chandler and Talladega, erode very readily.

Fertility should be maintained by use of fertilizers, manures, green-manure crops, and cover crops.

These are excellent soils for forest. They should be cleared only if intensive management for other uses is practical.

Capability Unit IIIe–30

The soils in this capability unit are shallow, well drained, and fine in texture. They occur on low volcanic dikes or ridges in the Piedmont Plateau area and the red shale areas. They cover only 665 acres, about one-tenth of 1 percent of the county.

Only two soils in Frederick County are in this capability unit. They are—

- Legore silty clay loam, 0 to 15 percent slopes, moderately eroded.
- Legore gravelly silty clay loam, 0 to 15 percent slopes, moderately eroded.

These soils are well drained and fairly fertile, but they tend to be shallow, are difficult to work, and erode fairly readily. These characteristics make them difficult to handle. Although these soils are well drained, water moves through them so slowly that the largest part of the rainfall runs off over the surface. Erosion is very likely to occur unless long rotations, stripcropping, and other practices are used.

These are good soils for crops, particularly small grains, but special management is necessary. Separate management is inconvenient in many areas because the soils occur in long narrow strips, in many

places divided by a road along the center of the ridge. Most areas are only a minor part of the field that includes them, and the management of the other soils is likely to determine the management for the entire field. The other soils in the field are generally of capability units IIIe–13, IIe–10, or IVe–41.

These soils are used for general crops, mainly in a 3-year rotation. There is some pasture and some cutover forest. The rotation should be longer to provide more protection against erosion.

It is easy to stripcrop these soils because they occur in long narrow strips. Many areas are only one or two strips wide. The fertility of these soils is naturally good, but it can be improved by proper fertilization.

These soils are well suited to alfalfa in every characteristic except depth. Alfalfa needs a deeper rooting space than is provided by these shallow soils. Red clover would be a better hay crop. Grazing should be carefully controlled in pastures, because the shallow-rooted sod is easily damaged. These fine-textured soils are very easily puddled when livestock trample them when they are even a little too wet.

Capability Unit IIIe–40

This capability unit consists of level to rolling, shallow, droughty soils. The 19,325 acres in this unit amount to about 4.5 percent of the county area. More than half is Penn shaly loam, which occurs throughout the red shale and sandstone areas. The Brandywine and Linganore soils are located in the Piedmont Plateau section in the eastern part of the county.

The soils in this unit are—

Brandywine gravelly loam, 0 to 15 percent slopes, moderately eroded.
Linganore channery and gravelly loams, 0 to 15 percent slopes, moderately eroded.
Penn shaly loam, 0 to 15 percent slopes, moderately eroded.

These soils are generally about 1 foot in depth over bedrock. The natural surface soil is very thin. Where the soils have been plowed, considerable quantities of gravel, slate fragments, and shale have been mixed into the surface layer from the subsoil.

Even though these soils are readily permeable, their capacity to absorb and hold moisture is low because they are so shallow and contain such a large proportion of solid fragments of rock. Much of the rainwater runs off. Rills develop easily and enlarge into gullies unless erosion is controlled carefully.

General fertility is low. These soils are fair for most crops when the rainfall is distributed evenly through the growing season. Even with favorable rainfall and after fertilizers and lime have been applied, yields are only moderately good. Supplemental irrigation would make the most improvement in production of any practice used on these soils. In some areas water is not available, but in others irrigation should be tried.

These soils are used for all crops in a general farming pattern. Deep-rooted plants like alfalfa are commonly grown. A very common rotation runs for 2 years; corn is followed by small grain seeded with sweetclover, and the sweetclover is turned under before corn is planted again the third year. Considerable alfalfa is grown for hay. Alfalfa is usually seeded in spring on the red Penn soils and after midsummer on the other soils of the unit.

Rotations should be longer on these soils to protect them against erosion. Corn should be followed by alfalfa or other hay for 2 or more years. If small grain is included, the rotation should be at least 4 years long. The soils should be covered with vegetation for as much of the time as possible.

All farming operations should be on the contour. Stripcropping should be used. In most places the soil is not deep enough over the bedrock for construction of diversion terraces. Waterways should be heavily sodded. Tall fescue makes a good sod for waterway strips, and it will furnish considerable hay when mowed.

These soils especially need organic matter. This can be supplied by sweetclover and other hay-crop residues turned under. Animal manure will add organic matter and help maintain fertility. Complete fertilizers are needed for all crop and pasture plants. The amounts should be determined by soil tests.

A large part of these soils is in pastures, although these are not good pasture soils. The carrying capacity is rather low, and the soils are very easily overgrazed. These pastures dry out for longer periods during hot dry weather than do pastures on better soils nearby.

Capability Unit IIIw–1

This unit consists of poorly drained soils that developed on flood plains from material that was high in lime. Only one soil, Melvin silt loam, 0 to 3 percent slopes, is in this capability unit in Frederick County. It is scattered in small spots and strips on flood plains and in narrow draws and drainageways in the limestone valleys. Only 933 acres, or two-tenths of 1 percent of the county, is in this unit.

This soil is fertile, but it is usually very wet. In some locations it is flooded frequently. The spots in draws and drainageways are not flooded by streams, but they are likely to be covered with standing water just after heavy rains.

When properly managed, this soil is suitable for pasture, hay, and corn. Other crops are not suitable. Many spots of this soil are in good locations for fish ponds or stock watering ponds, where hazard of overflow is not a problem. The subsoil material is suitable in most places for pond construction.

If the soil is to be cultivated, low spots should be protected by cutoff or interceptor ditches to keep water from higher land from running onto this soil. A central V-ditch should be used to drain the soil area. Where these spots already have a permanent, channel drainageway, the banks should be cleaned, straightened where necessary, and sodded.

Some of this soil is planted to corn and then to hay that is mostly clover. Small grains are almost never included in these rotations. The soil is too wet for alfalfa.

Where this soil occupies the drainageways in cultivated fields, it is in many places left as a hay-sodded strip to carry away water from higher land. Where the soil occurs in fairly large areas along streams where there is danger of flooding, it is most commonly used for pasture.

Spots in pastures that are too wet to be drained easily can be planted to reed canarygrass. This grass is not so palatable as other pasture plants, but it grows well in wet soil and will furnish some browse for cattle. During wet weather, livestock should not be allowed to trample this soil. The pasture should be mowed to keep down weeds.

Capability Unit IIIw–11

The soils of this capability unit have very tight subsoils and occur entirely on nearly level upland areas. The 3,892 acres make up nine-tenths of 1 percent of the county. Of largest acreage is the Readington soil, which occurs in small areas in the red shale districts of the county.

The soils in this capability unit are—

Chalfont silt loam, 0 to 3 percent slopes.
Readington silt loam, 0 to 3 percent slopes.
Urbana silt loam, 0 to 3 percent slopes.

Because of the tight subsoil, drainage of these soils is somewhat poor to moderately good. It is in all places slow enough to make the soils very wet in certain seasons.

These wet soils are best suited to hay and pasture. Tall fescue and clovers are good for either purpose. If fields are not to be cut for hay, bluegrass should be added to the mixture. Alfalfa is not a good crop on these soils, because they are too wet in some seasons and too dry in others, and because they tend to frost heave in winter. Corn planted early or at the usual time in spring has difficulty in germinating because the soils are so wet and cold. Later plantings germinate better but are more apt to be retarded by dry weather later in the season.

Unless artificially drained, these soils are used almost entirely for hay and pasture. Nearly all seeding mixtures contain clover. A little corn is grown on these soils; usually it is followed by 2 or more years of hay. This hay is sometimes grazed directly. On a few fields that have good artificial drainage, wheat and barley make fair yields.

The wetness of these soils is their most important management problem, and it is very difficult to correct. In many places these soils are so nearly level that there is not enough grade for surface ditches to carry away water. In many places, tile drains do not work properly because the subsoil is too tight and heavy. Pasture ridges drain strips of the surface, but they leave a very wet water-furrow.

The tight subsoils not only impede drainage but also prevent the movement of soil moisture up into the surface layers in dry seasons. In midsummer these soils are almost completely dry and very hard.

Neither machinery nor farm animals should be allowed on these soils when they are wet. The puddling and compacting of the surface would make them even more difficult to handle.

Hayfields and pastures should be kept well mowed to control weeds. These soils should be carefully fertilized and limed. Production of forage and grazing is fairly good as long as fertility is maintained. Manure will help keep the soils in good tilth, as well as add nutrients.

Capability Unit IVe–1

These are rolling to hilly, deep, well-drained soils that developed from material high in lime. There are only 735 acres, or less than two-tenths of 1 percent of the county area, in this capability unit.

The soils in this unit are—

Athol gravelly loam, 15 to 25 percent slopes, moderately eroded.
Conestoga silt loam, 15 to 25 percent slopes, moderately eroded.
Duffield and Frankstown silt loams, 15 to 25 percent slopes, moderately eroded.
Hagerstown loam, 15 to 25 percent slopes, moderately eroded.

Most areas of these soils are small spots or strips within areas of less steep soils. They are commonly used for general crops in the same rotation as surrounding soils. Corn, small grains, hay, and pasture are the chief crops.

These soils are too steep for cultivated crops to be grown regularly without a serious erosion hazard. Corn or other clean-tilled crops can be grown occasionally. This limited cultivation should be supplemented with very careful management to prevent erosion. All cultivation should be in contour strips, with diversion terraces above or below the strip, or both.

Hay and pasture are much more suitable for these soils than cultivated crops, and they should be grown at least 4 years out of 5. Some small odd areas of capability unit IVe–1 soils would be better kept in permanent pasture or meadow. Such areas should be plowed and replanted only when the sod has seriously deteriorated.

Although these soils are fertile, they will lose their productivity rapidly if they are cultivated often. Fertilizer should be added if soil tests show it is needed to get good pasture. Surplus water should be very carefully disposed of because of the danger of gullying.

Capability Unit IVe–3

This capability unit consists of rolling to hilly, deep, well-drained soils from material that was low in lime. There are 3,708 acres, or about nine-tenths of 1 percent of the county, in this unit. These soils are in scattered spots, mostly in the eastern Piedmont Plateau area and in the Middletown Valley.

The soils in this unit are—

Glenelg and Chester silt loams, 15 to 45 percent slopes, moderately eroded.
Montalto silty clay loam, 15 to 25 percent slopes, moderately eroded.
Myersville and Fauquier loams, 15 to 25 percent slopes, moderately eroded.

Myersville and Fauquier silt loams, 15 to 25 percent slopes, moderately eroded.
Norton gravelly silt loam, 15 to 25 percent slopes, moderately eroded.

Part of the unit is still in forest. Most of the rest is in hay or pasture. There are a few orchards in this unit.

These soils have not yet become severely eroded, but the hazard of such erosion is very great. These areas have been well managed, and this is the reason why more serious erosion damage has not occurred. Soils in this capability unit are not quite so fertile and productive as the soils in capability unit IVe–1, but they should be managed in the same way.

These soils are suitable for long rotations, in which clean-tilled crops are grown only 1 year in 5 or 6. They are not suitable for continuous cultivation, but they can produce an occasional row crop if proper precautions are taken. Permanent hay meadow, pasture, and forest are all good uses for these soils. Pasture of bluegrass and clover is one of the best and safest crops, if it is kept in good condition and not overgrazed.

Capability Unit IVe–10

The soils in this capability unit are rolling to hilly, eroded, and shallow. They developed from parent material that was low in lime. Areas of these soils are widely scattered in nearly all parts of the county, but they are most common in the Piedmont Plateau and the red shale areas. The 19,414 acres of this capability unit make up about 4.6 percent of the land area of the county.

The soils in this unit are—

Brandywine gravelly loam, 15 to 25 percent slopes, moderately eroded.
Cardiff channery loam, 8 to 15 percent slopes, severely eroded.
Cardiff channery loam, 15 to 25 percent slopes, moderately eroded.
Catoctin channery silt loam, 10 to 20 percent slopes, severely eroded.
Edgemont-Chandler channery loams, 10 to 20 percent slopes, severely eroded.
Fauquier loam, shallow, 8 to 15 percent slopes, moderately eroded.
Linganore channery and gravelly silt loams, 3 to 15 percent slopes, severely eroded.
Linganore channery and gravelly loams, 15 to 25 percent slopes, moderately eroded.
Manor channery and gravelly loams, 8 to 15 percent slopes, severely eroded.
Manor channery and gravelly loams, 15 to 25 percent slopes, moderately eroded.
Penn gravelly loam, 8 to 15 percent slopes, severely eroded.
Penn gravelly loam, 15 to 25 percent slopes, moderately eroded.
Penn loam, 8 to 15 percent slopes, severely eroded.
Penn loam, 15 to 25 percent slopes, moderately eroded.
Penn silt loam, 8 to 15 percent slopes, severely eroded.
Penn-Lansdale loams, 8 to 15 percent slopes, severely eroded.
Penn-Lansdale loams, 15 to 25 percent slopes, moderately eroded.

These soils are shallow, and most of them contain many fragments of rock. Their fertility is rather low. Many of the soils are very droughty. All of them are eroded to some degree, and most of those on the lesser slopes have been severely damaged by erosion.

A considerable part of this unit is still in forest. Cleared areas are used mostly for hay and pasture, and to some extent for corn, small grain, and fruit trees. Many of the pastures are poor and badly overgrazed. Considerable alfalfa is planted, but yields are not very high.

If row crops are to be grown on these soils, the rotation must be very long. Corn should be followed by alfalfa or mixed hay for 4 or 5 years. In many places these soils are best suited to permanent hay or pasture. The hayfields can be grazed part of the time. Some of these soils are especially well suited to orchards.

Management must be very careful on this capability unit. Erosion control is especially necessary.

Fertility should be improved and maintained on these soils in order to get good yields of either hay or pasture. The soils are so infertile and so droughty that the carrying capacity of pasture is generally low. Overgrazing is a serious hazard.

Capability Unit IVe–25

This capability unit consists of hilly, shallow to moderately deep, well-drained soils of the hills and mountains. These soils are scattered mostly at higher elevations in the Piedmont Plateau area, but some areas are located on mountain foot slopes. Only 1,255 acres, or about three-tenths of 1 percent of the county, belong to this capability unit.

The soils in this unit are—

Edgemont gravelly loam, 15 to 25 percent slopes, moderately eroded.
Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded.
Glenelg and Chester loams, 15 to 25 percent slopes, moderately eroded.
Thurmont gravelly loam, 15 to 25 percent slopes, moderately eroded.

Most of these soils are moderately fertile, but they are so steep that they cannot be cultivated often without serious soil losses. During dry summers these soils may be somewhat droughty.

There is little intensive dairying on this capability unit. General farming is most common. The cleared areas are used mainly for hay and pasture. Corn, small grains, berries, apples, and peaches are grown to some extent. Considerable areas are still in forest, mostly in the northwestern part of the county.

These soils are suitable for most crops, but their safest use is for hay, pasture, or well-sodded orchards. Clean-cultivated crops can be planted safely 1 year in about 5. One crop of corn and one of small grain can be grown in a 6-year rotation with 4 years of alfalfa or mixed hay. Special crops, such as peaches, apples, and berries, can be grown continuously.

Cropping should be in contour strips. Diversion terraces should be built wherever needed. The outlets of these terraces should be well built and carefully maintained to dispose of excess water without gullying.

Alfalfa is very well suited as a hay crop on all of

these soils except the Edgemont. It helps to maintain the nitrogen content of the soils, and good stands of alfalfa resist erosion quite well. Alfalfa needs careful liming and additions of phosphate and potash.

Soils should be tested and enough fertilizer added to maintain a good stand of vegetation. This vegetative cover will help to control erosion.

Capability Unit IVe–41

This unit consists of severely eroded, shallow soils with a tight subsoil. Only one soil, Urbana silt loam, 8 to 15 percent slopes, severely eroded, is in this capability unit in Frederick County. About 119 acres, less than 1 percent of the county area, is mapped in scattered small spots in the eastern part of the county.

The subsoil of this soil is so nearly impervious that a very high proportion of the rainfall does not soak in and, therefore, runs off. This runoff has caused severe erosion because the soil has not been carefully managed. Productivity is low. Hay yields are fairly good in a crop rotation, but yields of cultivated crops are poor. Some spots are idle and unproductive.

This soil can be used for crops occasionally if properly managed. It should first be limed and fertilized well, then seeded to red clover or a grass-and-clover mixture. It should be left in hay for at least 3 years, regularly cut, and fertilized at intervals. After 3 or 4 years, the sod can be broken for a corn crop, to be followed immediately by hay. This cropping system would gradually improve the tilth, organic-matter content, and productivity of these areas. The hay can be grazed part of the time if care is taken not to allow overgrazing.

Another good use for this soil is permanent pasture. After proper fertilizing and liming, bluegrass, probably with clover, should be seeded. This pasture should not be grazed until the sod is well established. Grazing should be managed carefully within the carrying capacity of the pasture. Livestock should be removed when the soil is wet, to avoid trampling and puddling of the surface soil. Pasture should be rested during droughts. Weeds should be mowed regularly.

This soil would especially benefit from heavy applications of barnyard manure.

Capability Unit Vw–1

This unit consists of moderately well drained to somewhat poorly drained soils on flood plains. This is the most extensive capability unit of flood-plain soils in the county. About 3.1 percent of the county, 13,328 acres altogether, consists of these soils. They are located mostly in the Piedmont Plateau area, in the Middletown Valley, and along smaller streams in the mountains, but a few areas also are in the red shale and limestone valley parts of the county.

The soils in this unit are—

Alluvial land.
Chewacla silt loam, 0 to 3 percent slopes.
Lindside silt loam, 0 to 3 percent slopes.
Rowland silt loam, 0 to 3 percent slopes.

These soils are subject to very frequent damaging overflow. They are intermediate in drainage between the well-drained flood-plain soils of capability unit I–6 and the poorly drained flood-plain soils of capability unit VIw-1. They are also intermediate in productivity; they are less productive than the well-drained soils but more productive than the poorly drained soils.

A few forests remain on these soils, especially along the streams in the mountains. Most areas have been cleared for pasture. Hay is grown in some places. Cultivated crops are not suitable for these soils because the severe flood hazard prevents normal production.

These soils are not so wet as the soils of capability unit VIw–1, and they are more productive after they have been drained and improved. Management practices that are similar to those needed for soils of capability unit VIw–1 can be used to improve the soils of capability unit Vw–1. Such management includes interception of runoff from higher land, surface drainage by open ditches, cleaning and straightening of streambanks, fertilizing, and weed control. These practices are somewhat easier to apply and less costly to maintain on this unit than on capability unit VIw–1.

Capability Unit Vw–2

This unit contains the poorly drained soils in the uplands. They lie in depressions and on flats in the uplands, in depressions on old stream terraces, and in some of the sloping areas around and above the heads of small intermittent drainageways. These soils are not flooded by streams. There are 8,520 acres of this unit, about 2 percent of the county area, scattered in rather small spots. Half are in the red shale areas, and about one-fourth are in depressions at the head of drainageways in the Piedmont Plateau area.

The soils in this unit are—

Croton silt loam, overwashed, 0 to 8 percent slopes.
Guthrie silt loam, 0 to 3 percent slopes.
Lantz silt loam, 0 to 8 percent slopes.
Roanoke silt loam, moderately deep over cobbles, 0 to 3 percent slopes.
Watchung silt loam, 0 to 8 percent slopes.
Worsham silt loam, 0 to 8 percent slopes.

These soils are wet much of the time. They have a tight subsoil, which impedes drainage. This tight subsoil also slows the upward movement of water in dry seasons and makes the soils droughty.

Drainage should be improved by intercepting runoff water from higher land and by using V-type open ditches to carry away surface water. Tile drains may be satisfactory in some places, but the cost is high when compared to the probable returns.

Some areas have stands of water-tolerant trees, but most areas have been cleared. Hay is grown in some places, but most areas are in pasture or idle. Some artificially drained spots have been planted to corn, though this is not a suitable use. Even after drainage, these soils are too wet in spring for good germination of corn.

Pasture is the most important use for these soils. Hay is also suitable, but these are not good soils for

pasture or hay. Most of these soils need lime, and all of them need complete fertilizers for satisfactory growth of hay or pasture.

Orchardgrass or tall fescue should be planted with clover for hay. Bluegrass and clover is a good mixture for pasture. Regular mowing is needed to control weeds in pastures. Livestock should be kept off when these soils are very wet, because the trampling will puddle and pack the surface. In addition, grazing should be avoided when pastures become dry and brown in late midsummer.

Capability Unit VIe–2

The soils in this capability unit are fairly deep, eroded, rolling to steep soils that developed from material that was low in lime. The rolling soils are severely eroded, and the steep soils are moderately eroded. The soils are located in scattered small areas on the Piedmont Plateau and in the Middletown Valley. The 2,651 acres of these soils make up about six-tenths of 1 percent of the county.

The soils in this unit are—

Fauquier gravelly loam, 20 to 35 percent slopes, moderately eroded.
Fauquier silt loam, 20 to 35 percent slopes, moderately eroded.
Myersville and Fauquier loams, 25 to 45 percent slopes, moderately eroded.
Myersville and Fauquier silty clay loams, 8 to 15 percent slopes, severely eroded.
Norton gravelly silt loam, 25 to 45 percent slopes, moderately eroded.
Urbana silt loam, 15 to 25 percent slopes, moderately eroded.

These soils are so erodible that they would soon be destroyed if they were cultivated. They are generally unsuitable for row crops and, except for the lower slopes of the Fauquier soils, are not recommended for hay crops.

Pasture is a good use for these areas if it is well managed. Bluegrass does well. After a pasture is established, the chief precaution is to prevent overgrazing. Livestock should be kept off the sod when it is dried out during the summer. The soil should be tested at intervals and lime and fertilizer added as needed.

Forest is in many places the most productive crop on these soils. Only a small part of this unit is now in forest. Some of the more eroded areas should be reforested.

Capability Unit VIe–3

This capability unit consists of rolling to steep, eroded, shallow soils that developed from material that was low in lime. The rolling areas are very severely eroded, and the steep areas are moderately eroded. These soils are most extensive in the Piedmont Plateau of the eastern and southeastern parts of the county, but they occur in almost all parts except the limestone valley around Frederick. They cover 22,901 acres, or about 5.4 percent of the land in the county.

The soils in this unit are—

Cardiff channery loam, 15 to 25 percent slopes, severely eroded.
Cardiff channery loam, 25 to 45 percent slopes, moderately eroded.
Catoctin channery silt loam, 20 to 35 percent slopes, moderately eroded.
Catoctin channery silt loam, 20 to 35 percent slopes, severely eroded.
Catoctin channery silt loam, 35 to 55 percent slopes, moderately eroded.
Chandler and Talladega channery loams, 20 to 35 percent slopes, moderately eroded.
Chandler and Talladega channery loams, 20 to 35 percent slopes, severely eroded.
Chandler and Talladega silt loams, 20 to 35 percent slopes, moderately eroded.
Chandler and Talladega silt loams, 20 to 35 percent slopes, severely eroded.
Edgemont gravelly loam, 25 to 45 percent slopes.
Edgemont-Chandler channery loams, 20 to 35 percent slopes, moderately eroded.
Edgemont-Chandler channery loams, 20 to 35 percent slopes, severely eroded.
Fauquier gravelly loam, 20 to 45 percent slopes, severely eroded.
Fauquier silty clay loam, 10 to 20 percent slopes, very severely eroded.
Fauquier silty clay loam, 20 to 35 percent slopes, severely eroded.
Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded.
Highfield channery loam, 20 to 35 percent slopes, moderately eroded.
Highfield channery loam, 20 to 35 percent slopes, severely eroded.
Highfield silt loam, 20 to 35 percent slopes, severely eroded.
Legore gravelly silty clay loam, 15 to 25 percent slopes, moderately eroded.
Manor channery and gravelly loams, 15 to 25 percent slopes, severely eroded.
Manor channery and gravelly loams, 25 to 45 percent slopes, moderately eroded.
Penn loam and gravelly loam, 15 to 25 percent slopes, severely eroded.
Penn shaly loam, 3 to 15 percent slopes, severely eroded.
Penn shaly loam, 15 to 25 percent slopes, moderately eroded.
Penn shaly loam, 15 to 25 percent slopes, severely eroded.
Penn soils, 25 to 50 percent slopes, moderately eroded.
Penn-Lansdale loams, 15 to 25 percent slopes, severely eroded.

These are not the very steepest soils of the county, but they are skeletal and droughty. All of the soils are acid.

The less eroded parts of this capability unit are generally still in forest. The areas that have been cleared and used for cultivated crops are the most severely eroded. Most of the cleared areas have been abandoned after losing their productivity, and they are now idle or used for grazing.

Crops will grow on these soils, but the cultivation causes extensive soil losses, no matter what conservation practices are used. Hay is not a safe crop in these areas.

Grazing is the most intensive use suitable for these soils. Many pastures are in poor condition because they have been overgrazed. These pastures should never be heavily grazed, because an intact sod is necessary to prevent soil losses. Pastures can be improved by contour furrows, ridges, and low terraces to slow the runoff and let moisture soak into the subsoil. Both lime and fertilizers are needed to establish and maintain pasture. The basic sod should be bluegrass, but after the soil is properly limed, clovers should also be used. Both grass and clover should be well established before the pasture is grazed at all.

Brush and weeds will become a problem in these pastures if they are not mowed. Weeds in areas too rough to be mowed should be cut with a hand scythe or killed with chemical herbicides. Sprouts of sassafras, hickory, and other trees must be controlled, but a few trees can be left for shade.

If pastures cannot be managed easily, these areas should be reforested. Fires must be prevented, and young trees should be protected from grazing and trampling by livestock.

Capability Unit VIw–1

This unit contains poorly drained, acid soils that developed on the flood plains of streams from material low in lime. Most of these soils lie along small to medium-sized streams on the Piedmont Plateau and in the Middletown Valley, and some are in the red shale areas. They make up 7,223 acres, or 1.7 percent of the county.

The soils in this unit are—

Bowmansville silt loam, 0 to 8 percent slopes.
Wehadkee silt loam, 0 to 3 percent slopes.

These soils are subject to very frequent damaging overflow. They are the wettest soils of the flood plains. They are saturated for most of the winter and spring and frequently at other times after heavy rains. These soils are often flooded when streams overflow during spring rains and thaws.

Some areas of these soils are covered by willow, alder, birch, and other water-tolerant trees. Most areas have been cleared and are used for unimproved pasture. In the few areas that have been partly drained, some hay is grown. These soils are so unproductive that complete drainage is not worth the cost.

The soils can be partly drained in some places by intercepting the runoff from higher land and channeling it into the stream. Open V-type ditches will improve surface drainage in some places, but the material dug out should not be left along the ditch sides; otherwise, surface water will not drain freely into the ditch.

After these soils have been partly drained, their best use is for pasture. Bluegrass and clover make a good sod, and tall fescue can be added. To keep the sod in good condition, pasture should be protected against overgrazing and trampling by livestock when it is too wet. These soils are best for temporary reserve pastures for use in dry periods.

Wet areas that cannot be drained can be planted to reed canarygrass. This grass can be used for pasture, hay, or silage, although it is generally less palatable to livestock than more common pasture plants. It can be combined with other more palatable plants in silage.

Along some of the smaller streams, flooding can be lessened by cleaning, straightening, and deepening stream channels. Streambanks that have been cleaned and straightened should be sodded to prevent erosion.

Capability Unit VIs–1

The soils in this capability unit are too rocky for cultivation, and they contain outcrops of limestone. There are 1,784 acres of these soils, all in or near the limestone valley area. They make up about four-tenths of 1 percent of the county.

The soils in this unit are—

Athol rocky loam, 0 to 15 percent slopes, moderately eroded.
Hagerstown rocky loam, 3 to 15 percent slopes, moderately eroded.
Hagerstown rocky clay, 8 to 15 percent slopes, severely eroded.

These soils are well drained, naturally fertile, and responsive to good management. They are a little droughty where they are shallow over bedrock. They are too rocky to be cultivated with ordinary farm machinery.

Practically all of these soils have been cleared, but most areas are used for pasture. Mixed hay and some crops may be grown on some of the less rocky areas, but generally these soils are best suited to pasture.

Bluegrass does very well, and it should be seeded with some clover. A few spots support thin woods that furnish shade for livestock.

The first requirement of managing these soils is to remove as much rock as possible from the fields. The soils should then be properly limed and fertilized. Generally, less lime and fertilizer will be needed on these areas than on most other soils of the county.

These are good pasture soils. If the pasture is well managed and not overgrazed, it can be maintained in good condition for many years. If pastures are too rocky to be mowed easily by machine, some hand work or chemical treatment should be used to control weeds.

These areas are also suitable for woodlots or for wildlife cover. Desirable trees and shrubs should be planted.

Capability Unit VIs–2

This capability unit consists of nearly level to rolling, very stony soils that developed from parent materials that were low in lime. Most of them are moderately eroded, but stoniness is their most limiting characteristic.

These soils are located in all parts of the county except in the limestone valleys and the red shale areas. They cover 25,272 acres, about 5.9 percent of the county. Most of them are in the mountains, especially on Catoctin Mountain.

The soils in this unit are—

Augusta very stony loam, 0 to 8 percent slopes.
Braddock very stony loam, 3 to 15 percent slopes.
Chandler and Talladega very stony loams, 0 to 20 percent slopes, moderately eroded.
Clymer very stony loam, 0 to 20 percent slopes.
Edgemont very stony loam, 0 to 20 percent slopes.
Edgemont-Chandler very stony loams, 0 to 20 percent slopes.
Fauquier very stony loam, 0 to 20 percent slopes, moderately eroded.
Glenville very stony silt loam, 0 to 8 percent slopes.
Highfield very stony loam, 0 to 20 percent slopes.
Legore very stony clay loam, 0 to 15 percent slopes.
Manor very stony loam, 3 to 15 percent slopes.

Montalto very stony clay loam, 0 to 15 percent slopes, moderately eroded.
Norton very stony loam, 3 to 8 percent slopes.
Thurmont very stony loam, 0 to 15 percent slopes.

These soils are not so steep nor so severely eroded as the soils in capability unit VIIs–3, but they are somewhat similar.

Practically none of this capability unit is cultivated. Most of it is forested. Pasture is the most common use for the cleared areas. If these soils were not stony, they would be suitable for the common crops of the county.

As much stone as practical should be removed from pastures. Lime and fertilizer should be used. Bluegrass or orchardgrass with clover is the best seeding mixture. A good sod must be maintained to prevent severe erosion and loss of fertility. Overgrazing is the greatest hazard on these pastures, especially before the grass and clover are well established. Control of weeds and brush is necessary, but it may be somewhat difficult.

Forest is also a good use for these soils. Most of the forests in this capability unit are in National and State parks and in the Frederick municipal watershed area. Some forests are privately owned. Forests on these soils are valuable for timber, for watershed protection areas, and for wildlife refuges.

Cleared land that is not pastured should be reforested. All forests, especially newly planted trees, should be protected from grazing by livestock. Fires should be prevented.

Capability Unit VIIe–1

This capability unit consists of hilly, severely eroded, rocky soils that have many limestone outcrops. In Frederick County it contains only 29 acres of Hagerstown rocky clay, 15 to 25 percent slopes, severely eroded, which is located in the limestone valley section.

The only good use for these small isolated spots is for home woodlots. Black locust trees for fenceposts or other trees that can be used on the farm should be planted. The fast-growing clumps of brush should be grubbed out to allow the young trees to establish themselves. The areas should be fenced to keep out livestock. Border hedgerows of seed-producing grasses or shrubs would make good cover for game birds and animals.

Capability Unit VIIe–3

This capability unit consists of rolling to very steep, shallow soils, most of which are severely eroded. These soils are in all parts of the county except the limestone valley area, but they are most common in the rolling to very steep parts of the Piedmont Plateau in the eastern third of the county. There are 10,926 acres in this capability unit, or about 2.6 percent of the county.

The soils in this unit are—

Brandywine gravelly loam, 15 to 55 percent slopes, severely eroded.
Cardiff channery loam, 15 to 55 percent slopes, very severely eroded.
Cardiff channery loam, 45 to 55 percent slopes, moderately eroded.
Catoctin channery silt loam, 20 to 55 percent slopes, very severely eroded.
Chandler and Talladega channery loams, 35 to 45 percent slopes, moderately eroded.
Fauquier loam, shallow, 15 to 45 percent slopes, moderately eroded.
Fauquier silty clay loam, 20 to 45 percent slopes, very severely eroded.
Glenelg gravelly loam, 15 to 45 percent slopes, very severely eroded.
Highfield channery loam, 20 to 35 percent slopes, very severely eroded.
Highfield channery loam, 35 to 45 percent slopes, moderately and severely eroded.
Linganore channery and gravelly silt loams, 15 to 25 percent slopes, severely and very severely eroded.
Linganore channery and gravelly silt loams, 25 to 55 percent slopes, severely eroded.
Manor channery and gravelly loams, 15 to 25 percent slopes, very severely eroded.
Manor channery and gravelly loams, 25 to 55 percent slopes, severely and very severely eroded.
Penn soils, 3 to 8 percent slopes, very severely eroded.
Penn soils, 8 to 15 percent slopes, very severely eroded.
Penn soils, 15 to 25 percent slopes, very severely eroded.
Penn soils, 25 to 50 percent slopes, severely eroded.

These soils are not rocky or stony like the soils of capability units VIIe–1 and VIIs–3, but most of them contain considerable gravelly, channery, or shaly material. Almost all of these soils are very shallow. They have low moisture-supplying capacity and are very droughty in midsummer. Fertility is low.

These soils are not suitable for cultivation, and they are not recommended for either hay or pasture. All areas that have been cultivated are now severely or very severely eroded. Most of these are now idle or in poor pasture. They will continue to lose soil and fertility until they are protected by a complete and undisturbed vegetative cover. As many acres as possible of these eroded soils should be reforested.

The preparation of the soils for reforestation, selection of species for particular sites, methods and seasons of planting, obtaining planting materials, protection of young trees from livestock damage and from fires, thinning of growing trees, and many other forest management problems will need to be considered carefully.

Capability Unit VIIs–2

The soils in this capability unit are very shallow, very droughty, and very stony. This unit is located mainly on the steep, broken parts of South Mountain, Catoctin Mountain, and Sugarloaf Mountain. A few hundred acres are on stony broken ridges in the Piedmont Plateau area. Altogether there are 19,265 acres in this capability unit, or about 4.5 percent of the county.

The soils in this unit are—

Dekalb very stony loam, 0 to 35 percent slopes.
Linganore very stony loam, 3 to 55 percent slopes.
Rough stony land.

This is the stoniest and most rugged land in the county. It has little true soil, and that is poor. It

has practically no agricultural use. Few acres have ever been cleared.

Large areas of this land are in State or National forests and parks and in watershed protection areas. This is probably their most economical use. Some of the forests on this unit have been severely cut over, but they are reforesting themselves.

Capability Unit VIIs–3

The soils in this capability unit are steep and very stony, or severely to very severely eroded, or both. Stoniness is the most limiting characteristic for most of the soils in this unit. They are rolling to very steep. This is an extensive unit, which covers 27,250 acres, or about 6.4 percent of the county. Most of the soils are located in the mountains, but some small areas are on the Piedmont Plateau, in the Middletown Valley, and on some of the rougher mountain foot slopes.

The soils in this unit are—

Braddock soils, 15 to 25 percent slopes, moderately eroded.
Chandler and Talladega very stony loams, 20 to 45 percent slopes, moderately eroded.
Edgemont very stony loam, 20 to 60 percent slopes.
Edgemont-Chandler very stony loams, 20 to 60 percent slopes.
Fauquier very stony loam, 20 to 50 percent slopes, moderately eroded.
Highfield very stony loam, 20 to 45 percent slopes.
Legore very stony clay loam, 15 to 50 percent slopes.
Lehigh slaty silty clay loam, 3 to 15 percent slopes, very severely eroded.
Manor very stony loam, 15 to 55 percent slopes.
Montalto very stony clay loam, 15 to 45 percent slopes.
Myersville and Fauquier clay loams, 15 to 25 percent slopes, very severely eroded.
Myersville and Fauquier loams, 25 to 50 percent slopes, severely eroded.
Myersville and Fauquier very stony loams, 3 to 35 percent slopes.
Myersville and Fauquier very stony loams, 35 to 50 percent slopes.

These soils have such unfavorable characteristics that they are of little agricultural use except for forests, watershed protection areas, and wildlife refuges. It would be extremely difficult to conserve these soils under cultivation, and most parts are too steep, stony, or eroded even for hay or pasture.

The less eroded parts of this unit are in forest and should remain forested. The areas that have been cleared and farmed are more severely eroded. These areas should be reforested with suitable trees. Shortleaf pine is a quick-growing and useful species for these soils, and various other trees can be planted. Some areas may reforest themselves if fenced away from livestock and protected from fires, although perhaps not with suitable trees.

Capability Unit VIIs–4

This capability unit contains very stony, poorly drained soils in depressions on the uplands. Stoniness is the most limiting characteristic of these soils They lie in scattered small or very small spots in parts of the Piedmont Plateau section and especially in the northwestern part of the county between Ellerton and the Pennsylvania State line. There are 1,237 acres in this capability unit, or about three-tenths of 1 percent of the county.

The soils in this unit are—

Lantz very stony loam, 0 to 15 percent slopes.
Worsham very stony silt loam, 0 to 8 percent slopes.

These soils have little agricultural use. They are entirely unsuited to crops of any kind. They are too stony and too wet for practical management as pasture. They can be grazed, but grazing is very poor. Some browse for cattle is produced in dry seasons, but little else.

Drainage or other improvement of these soils is so difficult that it would hardly be worth the effort. Artificial reforestation is not practical, because few trees of economic value can be successfully planted on these soils. If these spots are fenced off from livestock and protected from fires, they may eventually grow up to shrubs and trees that will shelter wildlife and perhaps produce some usable timber.

Productivity Ratings

The soils of Frederick County vary considerably in productivity. Some consistently produce high yields of cultivated crops, and others are better suited to less intensive use.

Table 2 shows the estimated productivity of the soils of the county under the present average management, and under the better management suggested under the individual capability units.

The productivity ratings are percentages of a standard yield. The standard yield for each crop is shown at the head of the column. The soils of the county are listed alphabetically, and the percentage of the standard yield that is likely to be produced on each soil, under a given level of management, is listed as the productivity rating.

The ratings are estimated averages for a normal 5-year period. These estimates are based on information from the local representatives of the Soil Conservation Service, the county agent, and agricultural workers at the Maryland Agricultural Experiment Station, and on observations by farmers in the county.

The yields given are not presumed to be the maximum obtainable. The actual yields in tons or bushels per acre vary on the same soils, depending on variations in management, weather, crop varieties, and diseases. The relative productivity is not the same for all crops when comparing two soils. The relationship between productivity ratings for different soils for a given crop will tend to remain constant as long as changes in management, plant breeding, fertilization, and economic conditions affect all soils alike.

TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*

[The ratings in columns A indicate productivity under present management; those in columns B indicate productivity under improved management. Where no rating is given, either the soil is considered unsuitable for that crop or no information is available on which to base an estimate]

Soil	Productivity ratings																					
	Corn (100=50 bushels per acre)		Wheat (100=25 bushels per acre)		Barley (100=40 bushels per acre)		Oats (100=40 bushels per acre)		Alfalfa (100=4 tons per acre)		Red clover (100=2 tons per acre)		Mixed hay (100=2 tons per acre)		Soybean hay (100=2½ tons per acre)		Sweet corn (100=3 tons per acre)		Apples, peaches (100=200 bushels per acre)		Pasture (100=100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Alluvial land																					65	85
Athol gravelly loam, 0 to 3 percent slopes	120	160	160	220	125	175	125	175	85	115	110	150	115	150	105	130	115	150			150	180
Athol gravelly loam, 3 to 8 percent slopes, moderately eroded	100	140	140	200	100	150	100	150	75	100	100	150	105	150	100	120	110	140		110	135	170
Athol gravelly loam, 8 to 15 percent slopes, moderately eroded	90	120	100	160	90	135	85	135	70	95	90	135	95	140						85	110	140
Athol gravelly loam, 15 to 25 percent slopes, moderately eroded	70	100	70	100	60	100	60	100	55	75	75	110	80	115						75	90	120
Athol rocky loam, 0 to 15 percent slopes, moderately eroded	80	110	100	140	80	125	75	120	65	90	85	130	90	135							110	140
Augusta gravelly loam, 0 to 3 percent slopes	70	100	75	110	65	95					70	120	75	125			75	100			90	125
Augusta gravelly loam, 3 to 15 percent slopes, moderately eroded	60	80	70	100	50	85					60	110	65	120							80	110
Augusta silt loam, 0 to 8 percent slopes	75	100	75	110	75	110					70	120	75	125			80	110			110	140
Augusta very stony loam, 0 to 8 percent slopes																						
Bermudian fine sandy loam, 0 to 3 percent slopes	80	120									90	125	90	130	90	115	100	125			145	175
Bermudian silt loam, 0 to 3 percent slopes	100	140									100	125	100	130	100	120	105	135			155	185
Birdsboro silt loam, 0 to 3 percent slopes	100	130	95	120	90	110	90	125	70	90	85	125	85	130	95	120	90	120			100	135
Birdsboro silt loam, 3 to 8 percent slopes, moderately eroded	80	110	80	100	80	100	75	100	55	70	65	90	70	100	80	105	80	100			95	130
Bowmansville silt loam, 0 to 8 percent slopes																					70	100
Braddock cobbly loam, 3 to 8 percent slopes	80	100	85	120	80	105	75	110	60	75	70	110	75	115	80	100	80	100		90	100	130
Braddock gravelly loam, 3 to 8 percent slopes, moderately eroded	90	120	90	125	85	110	80	120	65	80	75	115	80	120	90	110	85	105		100	100	140
Braddock gravelly and cobbly loams, 8 to 15 percent slopes, moderately eroded	65	100	80	120	75	95	75	95	55	75	60	90	65	100						80	85	115
Braddock soils, 15 to 25 percent slopes, moderately eroded																						

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TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*—Continued

Soil	Productivity ratings																					
	Corn (100 = 50 bushels per acre)		Wheat (100 = 25 bushels per acre)		Barley (100 = 40 bushels per acre)		Oats (100 = 40 bushels per acre)		Alfalfa (100 = 4 tons per acre)		Red clover (100 = 2 tons per acre)		Mixed hay (100 = 2 tons per acre)		Soybean hay (100 = 2½ tons per acre)		Sweet corn (100 = 3 tons per acre)		Apples, peaches (100 = 200 bushels per acre)		Pasture (100 = 100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Braddock very stony loam, 3 to 15 percent slopes																					45	65
Brandywine gravelly loam, 0 to 15 percent slopes, moderately eroded	60	80	60	85	55	80	50	80	35	55	45	65	55	75						45	60	90
Brandywine gravelly loam, 15 to 25 percent slopes, moderately eroded	40	50	50	75	45	65	45	65	30	50	40	60	50	75						30	45	60
Brandywine gravelly loam, 15 to 55 percent slopes, severely eroded																						
Bucks silt loam, 0 to 3 percent slopes	100	130	95	120	90	110	90	125	70	90	85	125	85	125	95	120	90	120			95	130
Bucks silt loam, 3 to 8 percent slopes, moderately eroded	90	120	85	115	90	110	80	115	60	75	70	100	75	105	90	110	85	110			85	120
Captina silt loam, 0 to 8 percent slopes, moderately eroded	80	110	80	130	50	80	50	75			75	125	80	135	80	120	90	115			120	150
Cardiff channery loam, 0 to 8 percent slopes, moderately eroded	75	120	80	105	70	95	65	100	50	65	65	95	70	100	80	105	65	85		80	70	100
Cardiff channery loam, 8 to 15 percent slopes, moderately eroded	60	85	65	85	65	85	55	90	50	65	50	70	55	75						60	60	90
Cardiff channery loam, 8 to 15 percent slopes, severely eroded	35	50	50	70	40	55	40	55	35	50	40	60	40	65							40	55
Cardiff channery loam, 15 to 25 percent slopes, moderately eroded	40	55	50	75	45	65	45	65	45	60	50	65	50	70						35	45	60
Cardiff channery loam, 15 to 25 percent slopes, severely eroded																					35	50
Cardiff channery loam, 15 to 55 percent slopes, very severely eroded																						
Cardiff channery loam, 25 to 45 percent slopes, moderately eroded																					40	60
Cardiff channery loam, 45 to 55 percent slopes, moderately eroded																						
Catoctin channery silt loam, 0 to 10 percent slopes, moderately eroded	80	120	80	110	75	100	75	100	60	75	70	100	75	110	85	110	70	90		80	75	110

Catoctin channery silt loam, 10 to 20 percent slopes, moderately eroded	65	85	65	85	65	85	55	90	55	75	60	80	60	80	-----	-----	-----	-----	-----	50	70	100
Catoctin channery silt loam, 10 to 20 percent slopes, severely eroded	40	50	50	75	40	55	40	55	45	55	45	75	45	75	-----	-----	-----	-----	-----	-----	40	55
Catoctin channery silt loam, 20 to 35 percent slopes, moderately eroded	40	55	55	80	45	65	45	65	45	60	50	80	50	80	-----	-----	-----	-----	-----	40	50	70
Catoctin channery silt loam, 20 to 35 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	40	55
Catoctin channery silt loam, 20 to 55 percent slopes, very severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Catoctin channery silt loam, 35 to 55 percent slopes, moderately eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	45	60
Chalfont silt loam, 0 to 3 percent slopes	60	90	80	120	70	100	-----	-----	-----	-----	70	110	75	120	-----	-----	85	110	-----	-----	90	110
Chalfont silt loam, 3 to 15 percent slopes	50	75	50	70	50	75	-----	-----	-----	-----	50	65	50	70	-----	-----	-----	-----	-----	-----	75	90
Chandler and Talladega channery loams, 0 to 10 percent slopes, moderately eroded	60	95	70	95	65	90	65	90	50	65	50	80	60	90	-----	-----	60	85	-----	70	60	90
Chandler and Talladega channery loams, 10 to 20 percent slopes, moderately eroded	40	60	50	80	45	65	45	65	35	55	45	75	55	85	-----	-----	-----	-----	-----	50	45	70
Chandler and Talladega channery loams, 20 to 35 percent slopes, moderately eroded	35	50	40	60	40	55	40	55	25	40	35	60	40	60	-----	-----	-----	-----	-----	30	40	60
Chandler and Talladega channery loams, 20 to 35 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	35	55
Chandler and Talladega channery loams, 35 to 45 percent slopes, moderately eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Chandler and Talladega silt loams, 0 to 10 percent slopes, moderately eroded	60	95	70	95	65	90	65	90	50	65	50	80	60	90	-----	-----	60	85	-----	70	60	90
Chandler and Talladega silt loams, 10 to 20 percent slopes, moderately eroded	40	60	50	80	45	65	45	65	35	55	45	75	55	85	-----	-----	-----	-----	-----	50	45	70
Chandler and Talladega silt loams, 20 to 35 percent slopes, moderately eroded	35	50	40	60	40	55	40	55	25	40	35	60	40	60	-----	-----	-----	-----	-----	30	40	60
Chandler and Talladega silt loams, 20 to 35 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	35	55
Chandler and Talladega very stony loams, 0 to 20 percent slopes, moderately eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	40	60

TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*—Continued

Soil	Productivity ratings																					
	Corn (100 = 50 bushels per acre)		Wheat (100 = 25 bushels per acre)		Barley (100 = 40 bushels per acre)		Oats (100 = 40 bushels per acre)		Alfalfa (100 = 4 tons per acre)		Red clover (100 = 2 tons per acre)		Mixed hay (100 = 2 tons per acre)		Soybean hay (100 = 2½ tons per acre)		Sweet corn (100 = 3 tons per acre)		Apples, peaches (100 = 200 bushels per acre)		Pasture (100 = 100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Chandler and Talladega very stony loams, 20 to 45 percent slopes, moderately eroded																						
Chester loam, 0 to 3 percent slopes, moderately eroded	120	160	100	140	100	140	100	140	70	90	100	130	110	150	100	120	110	135			130	165
Chester loam, 3 to 8 percent slopes, moderately eroded	100	140	100	140	100	135	100	135	70	90	100	130	110	140	100	120	110	130		120	125	160
Chester loam, 8 to 15 percent slopes, moderately eroded	90	120	85	120	90	120	90	125	65	85	90	120	95	130						110	110	140
Chewacla silt loam, 0 to 3 percent slopes																					120	150
Clymer very stony loam, 0 to 20 percent slopes																					35	55
Colbert silt loam, deep variant, 0 to 3 percent slopes	60	90	60	100	65	85					90	130	100	140			80	100			100	130
Conestoga silt loam, 0 to 8 percent slopes, moderately eroded	110	150	120	200	100	150	95	150	85	115	100	150	110	160	100	135	110	140		120	135	170
Conestoga silt loam, 8 to 15 percent slopes, moderately eroded	90	120	95	140	90	120	85	120	70	95	85	125	90	130						95	115	150
Conestoga silt loam, 15 to 25 percent slopes, moderately eroded	70	100	70	100	60	100	60	100	50	70	70	100	75	105						75	90	120
Congaree silt loam, 0 to 3 percent slopes	120	160									100	125	100	130	100	120	115	150			155	185
Congaree silt loam, local alluvium, 0 to 3 percent slopes	130	170	120	160	100	140	100	140	70	90	100	120	120	150	105	130	115	150			155	185
Congaree silt loam, local alluvium, 3 to 8 percent slopes	120	150	100	140	100	135	100	135	70	90	100	120	110	140	100	120	110	130			140	170
Croton silt loam, overwashed, 0 to 8 percent slopes																					90	110
Dekalb loam, 0 to 10 percent slopes, moderately eroded	50	80	50	85	50	75	50	75			40	65	50	80			50	65		60	45	75
Dekalb loam, 10 to 20 percent slopes, moderately eroded	40	70	40	70	35	65	35	65			30	50	40	70						30	40	65
Dekalb very stony loam, 0 to 35 percent slopes																						
Duffield silt loam, 0 to 3 percent slopes	140	200	160	240	140	200	150	200	90	140	125	160	130	170	115	150	120	170			150	190

Duffield and Frankstown silt loams, 0 to 3 percent slopes	130	190	150	210	110	175	125	165	80	120	120	175	125	175	110	140	120	160			140	175
Duffield and Frankstown silt loams, 3 to 8 percent slopes, moderately eroded	120	165	140	195	110	165	110	150	80	115	110	160	115	165	105	130	115	150			140	175
Duffield and Frankstown silt loams, 8 to 15 percent slopes, moderately eroded	100	140	120	180	100	150	100	150	75	105	110	160	115	165							120	150
Duffield and Frankstown silt loams, 15 to 25 percent slopes, moderately eroded	80	120	90	120	80	110	80	110	65	90	85	120	90	130							100	130
Duffield and Frankstown shaly silt loams, 0 to 3 percent slopes, moderately eroded	120	160	140	200	135	175	160	200	75	115	105	150	105	150	105	130	120	155			150	185
Duffield and Frankstown shaly silt loams, 3 to 8 percent slopes, moderately eroded	100	140	120	180	110	150	125	165	65	100	100	150	105	145	100	125	115	150			135	170
Duffield and Frankstown shaly silt loams, 8 to 15 percent slopes, moderately eroded	90	120	100	160	90	135	85	135	70	95	90	135	95	140							110	140
Edgemont gravelly loam, 0 to 8 percent slopes, moderately eroded	80	120	80	110	75	100	75	100	60	75	70	100	75	110	85	110	70	95		75	75	100
Edgemont gravelly loam, 8 to 15 percent slopes, moderately eroded	50	70	65	90	55	75	55	75	50	70	60	90	65	100						55	60	85
Edgemont gravelly loam, 15 to 25 percent slopes, moderately eroded	40	50	50	70	45	60	45	60	30	45	45	75	50	75						35	50	70
Edgemont gravelly loam, 25 to 45 percent slopes																					40	60
Edgemont very stony loam, 0 to 20 percent slopes																					40	60
Edgemont very stony loam, 20 to 60 percent slopes																						
Edgemont-Chandler channery loams, 0 to 10 percent slopes, moderately eroded	60	85	70	95	65	90	65	90			50	80	60	90			60	85		70	60	90
Edgemont-Chandler channery loams, 10 to 20 percent slopes, moderately eroded	50	80	55	80	50	75	50	75			40	60	50	75						35	50	75
Edgemont-Chandler channery loams, 10 to 20 percent slopes, severely eroded	30	45	35	55	30	45	30	45			25	40	30	50							30	40
Edgemont-Chandler channery loams, 20 to 35 percent slopes, moderately eroded	35	50	40	60	40	55	40	55			35	60	40	60						30	40	60
Edgemont-Chandler channery loams, 20 to 35 percent slopes, severely eroded																					35	50
Edgemont-Chandler very stony loams, 0 to 20 percent slopes																					40	60

TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*——Continued

Soil	Productivity ratings																					
	Corn (100 = 50 bushels per acre)		Wheat (100 = 25 bushels per acre)		Barley (100 = 40 bushels per acre)		Oats (100 = 40 bushels per acre)		Alfalfa (100 = 4 tons per acre)		Red clover (100 = 2 tons per acre)		Mixed hay (100 = 2 tons per acre)		Soybean hay (100 = 2½ tons per acre)		Sweet corn (100 = 3 tons per acre)		Apples, peaches (100 = 200 bushels per acre)		Pasture (100 = 100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Edgemont-Chandler very stony loams, 20 to 60 percent slopes																						
Elioak gravelly loam, 3 to 8 percent slopes, moderately eroded	90	120	85	115	90	110	80	115	60	75	70	100	75	105	90	110	85	110		110	85	115
Elioak gravelly loam, 8 to 15 percent slopes, moderately eroded	75	100	75	100	70	95	70	100	60	70	60	75	70	100						85	75	105
Elioak silt loam, 0 to 3 percent slopes, moderately eroded	100	130	95	120	90	115	90	125	70	90	85	125	85	125	95	120	90	120			95	120
Elioak silt loam, 3 to 8 percent slopes, moderately eroded	90	120	85	115	90	110	80	115	60	75	70	100	75	105	90	110	85	110		110	85	115
Elk gravelly loam, 3 to 8 percent slopes, moderately eroded	110	160	140	200	100	150	100	150	75	100	100	150	105	155	100	120	110	140			135	170
Elk loam, 0 to 3 percent slopes	130	180	160	220	125	175	125	175	85	115	110	150	115	150	105	130	115	150			150	190
Elk loam, 3 to 8 percent slopes, moderately eroded	110	160	140	200	100	150	100	150	75	100	100	150	105	155	100	120	110	140			135	170
Elk loam, 8 to 15 percent slopes, moderately eroded	90	120	100	160	90	135	85	135	70	95	90	130	95	135							120	150
Fauquier gravelly loam, 0 to 3 percent slopes	120	160	120	160	100	150	100	150	90	115	100	150	115	150	105	130	90	120			135	170
Fauquier gravelly loam, 3 to 10 percent slopes, moderately eroded	100	140	100	140	95	125	85	135	80	100	90	130	100	140	95	120	90	115		120	125	160
Fauquier gravelly loam, 10 to 20 percent slopes, moderately eroded	85	120	100	140	90	125	85	125	75	100	85	120	95	125						100	115	145
Fauquier gravelly loam, 20 to 35 percent slopes, moderately eroded	55	75	70	90	60	75	55	75	70	95	80	105	85	105						60	75	100
Fauquier gravelly loam, 20 to 45 percent slopes, severely eroded																					45	65
Fauquier loam, 0 to 3 percent slopes	120	160	120	160	100	150	100	150	90	115	100	150	115	150	105	130	90	120			135	170
Fauquier loam, 3 to 8 percent slopes, moderately eroded	100	140	100	140	95	125	85	135	80	100	90	130	100	140	95	120	90	115		120	125	160
Fauquier loam, 8 to 15 percent slopes, moderately eroded	85	120	100	140	90	125	85	125	75	100	85	120	95	125						100	115	145
Fauquier loam, shallow, 8 to 15 percent slopes, moderately eroded	45	60	60	80	50	70	50	70	60	75	65	90	70	95							60	85

Fauquier loam, shallow, 15 to 45 percent slopes, moderately eroded																						
Fauquier silt loam, 0 to 3 percent slopes	120	160	120	160	100	150	100	150	90	115	100	150	115	150	105	130	90	120			135	170
Fauquier silt loam, 0 to 10 percent slopes, moderately eroded	100	140	100	140	95	125	85	135	80	100	90	130	100	140	95	120	90	115		120	125	160
Fauquier silt loam, 10 to 20 percent slopes, moderately eroded	85	120	100	140	90	125	85	125	75	100	85	120	95	125						100	115	145
Fauquier silt loam, 20 to 35 percent slopes, moderately eroded	55	75	70	90	60	75	55	75	70	95	80	105	85	105						60	75	100
Fauquier silty clay loam, 10 to 20 percent slopes, very severely eroded																					45	65
Fauquier silty clay loam, 20 to 35 percent slopes, severely eroded																					45	60
Fauquier silty clay loam, 20 to 45 percent slopes, very severely eroded																						
Fauquier very stony loam, 0 to 20 percent slopes, moderately eroded																					55	80
Fauquier very stony loam, 20 to 50 percent slopes, moderately eroded																						
Glenelg gravelly loam, 0 to 8 percent slopes, moderately eroded	95	130	95	120	90	115	80	125	65	80	80	110	85	120	90	110	90	115		110	100	140
Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded	80	110	80	110	80	100	80	110	65	80	80	110	85	120						95	100	130
Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded	45	60	55	80	50	70	50	70	50	65	55	90	60	110						40	60	80
Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded																					40	60
Glenelg gravelly loam, 15 to 45 percent slopes, very severely eroded																						
Glenelg and Chester loams, 3 to 8 percent slopes, moderately eroded	95	130	95	120	90	115	80	125	65	80	80	110	85	120	90	110	90	115		110	100	140
Glenelg and Chester loams, 8 to 15 percent slopes, moderately eroded	80	110	80	110	80	100	80	110	65	80	80	110	85	120						95	100	130
Glenelg and Chester loams, 15 to 25 percent slopes, moderately eroded	45	60	55	80	50	70	50	70	50	65	55	95	60	100						40	60	80
Glenelg and Chester silt loams, 0 to 3 percent slopes, moderately eroded	110	150	100	140	95	125	90	130	70	90	90	130	100	135	100	120	100	120			125	160
Glenelg and Chester silt loams, 3 to 8 percent slopes, moderately eroded	95	130	95	120	90	115	80	125	65	80	80	110	85	120	90	110	90	115		110	100	140

TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*—Continued

Soil	Productivity ratings																					
	Corn (100 = 50 bushels per acre)		Wheat (100 = 25 bushels per acre)		Barley (100 = 40 bushels per acre)		Oats (100 = 40 bushels per acre)		Alfalfa (100 = 4 tons per acre)		Red clover (100 = 2 tons per acre)		Mixed hay (100 = 2 tons per acre)		Soybean hay (100 = 2½ tons per acre)		Sweet corn (100 = 3 tons per acre)		Apples, peaches (100 = 200 bushels per acre)		Pasture (100 = 100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Glenelg and Chester silt loams, 8 to 15 percent slopes, moderately eroded	80	110	80	110	80	100	80	110	65	80	80	110	85	120	-----	-----	-----	-----	-----	95	100	130
Glenelg and Chester silt loams, 15 to 45 percent slopes, moderately eroded	50	70	60	85	50	70	50	70	60	80	70	100	75	105	-----	-----	-----	-----	-----	55	60	90
Glenville silt loam, 0 to 8 percent slopes	80	100	80	115	80	115	-----	-----	-----	-----	70	120	75	125	-----	-----	80	110	-----	-----	110	140
Glenville silt loam, 3 to 8 percent slopes, moderately eroded	60	90	60	100	50	75	-----	-----	50	75	60	110	70	115	-----	-----	-----	-----	-----	-----	90	120
Glenville very stony silt loam, 0 to 8 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Guthrie silt loam, 0 to 3 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	75	100
Hagerstown gravelly loam, 0 to 3 percent slopes	130	180	160	220	140	190	125	175	85	135	120	160	125	170	105	135	120	160	-----	-----	150	185
Hagerstown gravelly loam, 3 to 8 percent slopes, moderately eroded	120	165	140	200	110	165	100	150	80	115	120	160	125	165	105	130	120	155	-----	-----	140	170
Hagerstown gravelly loam, 8 to 15 percent slopes, moderately eroded	100	140	110	160	100	150	90	135	75	105	100	150	105	150	-----	-----	-----	-----	-----	-----	120	150
Hagerstown loam, 0 to 3 percent slopes	130	180	160	220	140	190	125	175	85	135	120	160	125	170	105	135	120	160	-----	-----	150	185
Hagerstown loam, 0 to 8 percent slopes, moderately eroded	120	165	140	200	110	165	100	150	80	115	120	160	125	165	105	130	120	155	-----	-----	140	170
Hagerstown loam, 8 to 15 percent slopes, moderately eroded	100	140	110	160	100	150	90	135	75	105	100	150	105	150	-----	-----	-----	-----	-----	-----	120	150
Hagerstown loam, 15 to 25 percent slopes, moderately eroded	75	110	80	110	75	110	75	110	60	80	80	115	85	125	-----	-----	-----	-----	-----	-----	100	130
Hagerstown rocky clay, 8 to 15 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	50	80
Hagerstown rocky clay, 15 to 25 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Hagerstown rocky loam, 3 to 15 percent slopes, moderately eroded	70	100	95	140	95	125	90	125	50	75	90	130	90	130	-----	-----	-----	-----	-----	-----	110	140
Hagerstown silt loam, 0 to 3 percent slopes	130	180	160	240	130	190	120	170	90	140	125	160	130	170	110	140	120	160	-----	-----	150	190
Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded	120	165	140	210	110	165	100	150	80	115	120	160	125	165	105	130	120	155	-----	-----	140	175

Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded	100	140	110	160	100	150	90	135	75	105	100	150	105	150							120	150
Highfield channery loam, 0 to 10 percent slopes, moderately eroded	95	130	95	140	95	125	95	135	75	95	90	130	100	140	95	120	90	120			100	110	140
Highfield channery loam, 10 to 20 percent slopes, moderately eroded	75	100	75	100	75	100	75	105	65	85	75	115	85	125							65	80	110
Highfield channery loam, 20 to 35 percent slopes, moderately eroded	50	65	60	85	55	75	55	75	55	75	60	100	65	105							40	60	80
Highfield channery loam, 20 to 35 percent slopes, severely eroded																						45	60
Highfield channery loam, 20 to 35 percent slopes, very severely eroded																							
Highfield channery loam, 35 to 45 percent slopes, moderately and severely eroded																						45	60
Highfield silt loam, 0 to 10 percent slopes, moderately eroded	95	130	95	140	95	125	95	135	75	95	90	130	100	140	95	120	90	120			100	110	140
Highfield silt loam, 10 to 20 percent slopes, moderately eroded	75	100	75	100	75	100	75	105	65	85	75	115	85	125							65	80	110
Highfield silt loam, 20 to 35 percent slopes, severely eroded																						45	60
Highfield very stony loam, 0 to 20 percent slopes																						55	70
Highfield very stony loam, 20 to 45 percent slopes																							
Huntington fine sandy loam, 0 to 3 percent slopes	80	120									90	125	90	130	90	115	100	125			145	175
Huntington silt loam, 0 to 3 percent slopes	130	170									110	150	110	150	110	130	125	155			160	190
Huntington silt loam, local alluvium, 0 to 3 percent slopes	150	220	160	240	140	215	160	200	85	135	125	175	125	175	120	150	120	170			160	190
Lantz silt loam, 0 to 8 percent slopes																						90	110
Lantz very stony loam, 0 to 15 percent slopes																							
Legore gravelly silty clay loam, 0 to 15 percent slopes, moderately eroded	70	100	80	100	75	100	70	100	50	75	80	110	80	110								85	100
Legore gravelly silty clay loam, 15 to 25 percent slopes, moderately eroded																						45	60
Legore silty clay loam, 0 to 15 percent slopes, moderately eroded	70	100	80	100	75	100	70	100	50	75	80	110	80	110								85	100
Legore very stony clay loam, 0 to 15 percent slopes																						50	70
Legore very stony clay loam, 15 to 50 percent slopes																							
Lehigh slaty loam, 3 to 15 percent slopes, moderately eroded	60	80	65	80	60	80			50	70	55	80	60	80								75	95

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TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*—Continued

Soil	Productivity ratings																					
	Corn (100 = 50 bushels per acre)		Wheat (100 = 25 bushels per acre)		Barley (100 = 40 bushels per acre)		Oats (100 = 40 bushels per acre)		Alfalfa (100 = 4 tons per acre)		Red clover (100 = 2 tons per acre)		Mixed hay (100 = 2 tons per acre)		Soybean hay (100 = 2½ tons per acre)		Sweet corn (100 = 3 tons per acre)		Apples, peaches (100 = 200 bushels per acre)		Pasture (100 = 100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Lehigh slaty silty clay loam, 3 to 15 percent slopes, very severely eroded																						
Lindside silt loam, 0 to 3 percent slopes																					130	160
Lindside silt loam, local alluvium, 0 to 3 percent slopes	80	115	100	140	80	110			55	75	90	135	100	140	100	130	100	130			130	165
Lindside silt loam, local alluvium, 3 to 8 percent slopes	80	110	90	140	55	85	60	85	50	75	85	135	90	140	90	130	100	130			130	160
Linganore channery and gravelly loams, 0 to 15 percent slopes, moderately eroded	50	80	60	80	50	80	50	75	40	60	55	80	60	85						50	65	95
Linganore channery and gravelly loams, 15 to 25 percent slopes, moderately eroded	35	50	40	60	40	55	40	55	25	40	35	60	40	60						30	45	60
Linganore channery and gravelly silt loams, 3 to 15 percent slopes, severely eroded	30	45	35	55	35	50	35	50			30	50	35	55							40	60
Linganore channery and gravelly silt loams, 15 to 25 percent slopes, severely and very severely eroded																						
Linganore channery and gravelly silt loams, 25 to 55 percent slopes, severely eroded																						
Linganore very stony loam, 3 to 55 percent slopes																						
Manor channery and gravelly loams, 0 to 8 percent slopes, moderately eroded	75	120	80	105	75	95	65	100	55	70	65	95	70	100	80	105	70	90		80	75	110
Manor channery and gravelly loams, 8 to 15 percent slopes, moderately eroded	60	90	70	90	65	85	60	95	50	70	50	70	55	75						45	65	95
Manor channery and gravelly loams, 8 to 15 percent slopes, severely eroded	35	50	45	65	40	55	40	55	35	50	40	60	40	65							40	55

Manor channery and gravelly loams, 15 to 25 percent slopes, moderately eroded	40	55	50	70	45	65	45	65	45	65	45	65	50	70	-----	-----	-----	-----	-----	35	55	75
Manor channery and gravelly loams, 15 to 25 percent slopes, severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	35	50
Manor channery and gravelly loams, 15 to 25 percent slopes, very severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Manor channery and gravelly loams, 25 to 45 percent slopes, moderately eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	40	60
Manor channery and gravelly loams, 25 to 55 percent slopes, severely and very severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Manor very stony loam, 3 to 15 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	40	60
Manor very stony loam, 15 to 55 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Melvin silt loam, 0 to 3 cent slopes	70	120	-----	-----	-----	-----	-----	-----	-----	-----	70	140	75	140	-----	-----	-----	-----	-----	-----	90	140
Montalto silty clay loam, 0 to 8 percent slopes, moderately eroded	100	140	110	145	100	130	85	135	80	100	100	125	100	140	95	120	100	135	-----	105	125	160
Montalto silty clay loam, 8 to 15 percent slopes, moderately eroded	85	120	100	135	95	120	80	125	75	100	90	120	95	130	-----	-----	-----	-----	-----	95	115	145
Montalto silty clay loam, 15 to 25 percent slopes, moderately eroded	55	75	80	105	70	85	70	90	70	95	85	110	90	120	-----	-----	-----	-----	-----	55	75	100
Montalto very stony clay loam, 0 to 15 percent slopes, moderately eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	55	80
Montalto very stony clay loam, 15 to 45 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Myersville and Fauquier clay loams, 15 to 25 percent slopes, very severely eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Myersville and Fauquier gravelly loams, 0 to 3 percent slopes	120	160	120	160	100	150	100	150	90	115	100	150	115	150	105	130	90	120	-----	-----	135	170
Myersville and Fauquier gravelly loams, 3 to 8 percent slopes, moderately eroded	100	140	100	140	95	125	85	135	80	100	90	130	100	140	95	120	90	115	-----	120	125	160
Myersville and Fauquier gravelly loams, 8 to 15 percent slopes, moderately eroded	85	120	100	140	90	125	85	125	75	100	85	120	95	125	-----	-----	-----	-----	-----	100	115	145
Myersville and Fauquier loams, 0 to 3 percent slopes	120	160	120	160	100	150	100	150	90	115	100	150	115	150	105	130	90	120	-----	-----	135	170
Myersville and Fauquier loams, 3 to 8 percent slopes, moderately eroded	100	140	100	140	95	125	85	135	80	100	90	130	100	140	95	120	90	115	-----	120	125	160

TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*—Continued

Soil	Productivity ratings																					
	Corn (100 = 50 bushels per acre)		Wheat (100 = 25 bushels per acre)		Barley (100 = 40 bushels per acre)		Oats (100 = 40 bushels per acre)		Alfalfa (100 = 4 tons per acre)		Red clover (100 = 2 tons per acre)		Mixed hay (100 = 2 tons per acre)		Soybean hay (100 = 2½ tons per acre)		Sweet corn (100 = 3 tons per acre)		Apples, peaches (100 = 200 bushels per acre)		Pasture (100 = 100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Myersville and Fauquier loams, 8 to 15 percent slopes, moderately eroded	85	120	100	140	90	125	85	125	75	100	85	120	95	125						100	115	145
Myersville and Fauquier loams, 15 to 25 percent slopes, moderately eroded	55	75	70	90	60	75	55	75	70	95	80	105	85	105						60	75	100
Myersville and Fauquier loams, 25 to 45 percent slopes, moderately eroded																					55	80
Myersville and Fauquier loams, 25 to 50 percent slopes, severely eroded																						
Myersville and Fauquier silt loams, 0 to 3 percent slopes	120	160	120	160	100	150	100	150	90	115	100	150	115	150	105	130	90	120			135	170
Myersville and Fauquier silt loams, 3 to 8 percent slopes, moderately eroded	100	140	100	140	95	125	85	135	80	100	90	130	100	140	95	120	90	115		120	125	160
Myersville and Fauquier silt loams, 8 to 15 percent slopes, moderately eroded	85	120	100	140	90	125	85	125	75	100	85	120	95	125						100	115	145
Myersville and Fauquier silt loams, 15 to 25 percent slopes, moderately eroded	55	75	70	90	60	75	55	75	70	95	80	105	85	105						60	75	100
Myersville and Fauquier silty clay loams, 8 to 15 percent slopes, severely eroded																					65	85
Myersville and Fauquier very stony loams, 3 to 35 percent slopes																					55	80
Myersville and Fauquier very stony loams, 35 to 50 percent slopes																						
Norton gravelly silt loam, 0 to 3 percent slopes	100	140	110	140	95	140	95	140	75	100	85	140	100	150	95	130	100	135			130	165
Norton gravelly silt loam, 3 to 8 percent slopes, moderately eroded	95	130	95	135	90	105	85	125	70	90	80	125	90	130	90	120	90	115		100	110	140
Norton gravelly silt loam, 8 to 15 percent slopes, moderately eroded	80	110	80	110	80	100	80	110	65	85	80	110	85	120						95	100	130
Norton gravelly silt loam, 15 to 25 percent slopes, moderately eroded	50	70	60	85	50	70	50	70	60	80	70	100	75	105						55	60	90

Norton gravelly silt loam, 25 to 45 percent slopes, moderately eroded																						50	70
Norton very stony loam, 3 to 8 percent slopes																						45	65
Penn gravelly loam, 0 to 8 percent slopes, moderately eroded	70	115	70	100	70	95	65	100	50	65	60	85	65	90	75	100	65	85				70	100
Penn gravelly loam, 0 to 8 percent slopes, severely eroded	50	70	55	80	55	75	50	75	40	55	50	70	55	75								50	80
Penn gravelly loam, 8 to 15 percent slopes, moderately eroded	55	75	60	90	60	85	55	85	45	65	55	75	60	80								60	90
Penn gravelly loam, 8 to 15 percent slopes, severely eroded	30	45	35	55	35	50	35	50	30	45	30	50	35	55								40	60
Penn gravelly loam, 15 to 25 percent slopes, moderately eroded	35	50	45	65	40	60	40	60	35	50	40	60	45	70								45	65
Penn loam, 0 to 8 percent slopes, moderately eroded	70	115	70	100	70	95	65	100	50	65	60	85	65	90	75	100	65	85				70	100
Penn loam, 8 to 15 percent slopes, moderately eroded	55	75	60	90	60	85	55	85	45	65	55	75	60	80								60	90
Penn loam, 8 to 15 percent slopes, severely eroded	30	45	35	55	35	50	35	50	30	45	30	50	35	55								40	60
Penn loam, 15 to 25 percent slopes, moderately eroded	35	50	45	65	40	60	40	60	35	50	40	60	45	70								45	65
Penn loam and gravelly loam, 15 to 25 percent slopes, severely eroded																						35	55
Penn shaly loam, 0 to 15 percent slopes, moderately eroded	45	60	50	75	45	75	40	65	35	55	50	70	55	75								50	80
Penn shaly loam, 3 to 15 percent slopes, severely eroded	30	45	35	55	35	50	35	50	30	45	30	50	35	55								40	60
Penn shaly loam, 15 to 25 percent slopes, moderately eroded	30	45	35	55	35	50	35	50	30	45	30	50	35	55								40	60
Penn shaly loam, 15 to 25 percent slopes, severely eroded																						30	50
Penn silt loam, 0 to 8 percent slopes, moderately eroded	70	115	70	100	70	95	65	100	50	65	60	85	65	90	75	100	65	85				70	100
Penn silt loam, 3 to 8 percent slopes, severely eroded	50	70	55	80	55	75	50	75	40	55	50	70	55	75								50	80
Penn silt loam, 8 to 15 cent slopes, moderately eroded	55	75	60	90	60	85	55	85	45	65	55	75	60	80								60	90
Penn silt loam, 8 to 15 percent slopes, severely eroded	30	45	35	55	35	50	35	50	30	45	30	50	35	55								40	60
Penn soils, 3 to 8 percent slopes, very severely eroded																							
Penn soils, 8 to 15 percent slopes, very severely eroded																							
Penn soils, 15 to 25 percent slopes, very severely eroded																							

TABLE 2.—*Estimated productivity ratings of soils for specified crops under two levels of management*—Continued

Soil	Productivity ratings																					
	Corn (100 = 50 bushels per acre)		Wheat (100 = 25 bushels per acre)		Barley (100 = 40 bushels per acre)		Oats (100 = 40 bushels per acre)		Alfalfa (100 = 4 tons per acre)		Red clover (100 = 2 tons per acre)		Mixed hay (100 = 2 tons per acre)		Soybean hay (100 = 2½ tons per acre)		Sweet corn (100 = 3 tons per acre)		Apples, peaches (100 = 200 bushels per acre)		Pasture (100 = 100 cow-acre-days)[1]	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Penn soils, 25 to 50 percent slopes, moderately eroded																					40	55
Penn soils, 25 to 50 percent slopes, severely eroded																						
Penn-Lansdale loams, 0 to 8 percent slopes, moderately eroded	70	115	70	100	70	95	65	100	50	65	60	85	65	90	75	100	65	85			70	100
Penn-Lansdale loams, 8 to 15 percent slopes, moderately eroded	55	75	60	90	60	85	55	85	45	65	55	75	60	80							60	90
Penn-Lansdale loams, 8 to 15 percent slopes, severely eroded	30	45	35	55	35	50	35	50	30	45	30	50	35	55							40	60
Penn-Lansdale loams, 15 to 25 percent slopes, moderately eroded	35	50	45	65	40	60	40	60	35	50	40	60	45	70							45	65
Penn-Lansdale loams, 15 to 25 percent slopes, severely eroded																					40	55
Raritan silt loam, 0 to 3 percent slopes	80	110	80	115	80	115					75	125	80	125			80	110			90	120
Raritan silt loam, 3 to 8 percent slopes, moderately eroded	70	100	60	100	50	75					60	100	70	115							80	110
Readington silt loam, 0 to 3 percent slopes	65	90	70	100	65	95					80	120	85	125			90	115			100	130
Readington silt loam, 0 to 8 percent slopes, moderately eroded	55	80	60	100	50	85					70	125	75	125							90	120
Roanoke silt loam, moderately deep over cobbles, 0 to 3 percent slopes																					80	105
Rohrersville silt loam, 0 to 8 percent slopes	90	130	80	120	75	115					75	125	85	130			85	115			120	150
Rohrersville silt loam, 3 to 15 percent slopes, moderately eroded	70	120	60	100	60	85					60	110	75	125							120	150
Rough stony land																						
Rowland silt loam, 0 to 3 percent slopes																					120	150
Sequatchie sandy loam, neutral variant, 3 to 8 percent slopes, moderately eroded	70	100	70	100	65	100	65	100	50	70	70	100	80	115	80	105	80	100			100	130
Sequatchie sandy loam, neutral variant, 8 to 15 percent slopes, moderately eroded	50	80	60	90	50	85	50	85	45	80	60	85	65	90							75	100

Thurmont cobbly loam, 0 to 8 percent slopes	65	110	70	100	80	100	70	100	50	75	60	100	65	110	70	100	65	110	-----	90	80	115
Thurmont gravelly loam, 0 to 8 percent slopes, moderately eroded	70	120	80	110	80	115	75	110	55	80	65	110	70	115	80	110	75	115	-----	90	90	130
Thurmont gravelly loam, 8 to 15 percent slopes, moderately eroded	45	60	60	90	50	70	50	70	45	65	55	80	60	90	-----	-----	-----	-----	-----	55	55	80
Thurmont gravelly loam, 15 to 25 percent slopes, moderately eroded	35	50	50	70	45	60	45	60	30	45	45	75	50	75	-----	-----	-----	-----	-----	35	50	70
Thurmont gravelly and cobbly loams, 0 to 3 percent slopes	70	120	80	110	80	105	75	110	55	80	65	110	70	115	80	110	75	110	-----	-----	90	130
Thurmont silt loam, 0 to 3 percent slopes	80	130	85	120	85	110	80	125	65	85	75	125	75	130	85	120	80	120	-----	-----	90	130
Thurmont very stony loam, 0 to 15 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	50	75
Urbana silt loam, 0 to 3 percent slopes	70	95	85	120	65	95	-----	-----	-----	-----	85	125	90	140	-----	-----	90	115	-----	-----	100	130
Urbana silt loam, 3 to 15 percent slopes, moderately eroded	55	70	70	100	55	75	-----	-----	-----	-----	70	125	75	130	-----	-----	-----	-----	-----	-----	80	110
Urbana silt loam, 8 to 15 percent slopes, severely eroded	35	55	45	60	45	60	-----	-----	-----	-----	45	75	50	80	-----	-----	-----	-----	-----	-----	65	90
Urbana silt loam, 15 to 25 percent slopes, moderately eroded	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	65	90
Watchung silt loam, 0 to 8 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	80	105
Waynesboro gravelly loam, 0 to 8 percent slopes, moderately eroded	85	115	90	125	85	105	80	115	65	80	75	115	80	120	75	100	85	105	-----	100	100	140
Waynesboro gravelly loam, 8 to 15 percent slopes, moderately eroded	75	100	75	100	70	95	70	100	60	75	65	85	70	100	-----	-----	-----	-----	-----	90	75	105
Wehadkee silt loam, 0 to 3 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	70	100
Worsham silt loam, 0 to 8 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	70	100
Worsham very stony silt loam, 0 to 8 percent slopes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

[1] Cow-acre-days is the number of days 1 acre will graze 1 cow, horse, or steer without injury to the pasture.

Forests of the County[2]

About one-fourth of the land area of Frederick County is occupied by forests or woodland. About 60 percent of these forests are owned by the State and Federal governments. These State and National parks and forests are chiefly in mountain and intermountain areas.

More than half of all the forests of the county are located on three kinds of mountain soil. These are the Edgemont-Chandler complex of soils, the Highfield series, and the rugged and otherwise unclassified soils mapped as Rough stony land. Other mountain soils that support considerable acreages of forest are the Fauquier, Dekalb, Clymer, Chandler, and Talladega.

Most of the remaining forests of the county are on the rougher parts of the Piedmont Plateau and in scattered spots in the eastern and southeastern parts of the county. The largest acreage of these forests is on Manor channery and gravelly loams. Other forests are on the steeper and rougher parts of Linganore channery and gravelly loams, Glenelg gravelly loams, and Cardiff channery loams.

There is comparatively little forest on the other soils of Frederick County. Cropland and pasture take precedence over forest on all of the better agricultural soils and also on the better parts of the less important agricultural soils.

There are four general types of forest in Frederick County. One type is old-growth hardwood forest, and another is forest that has been cut over one or more times. A third type is forest that grows in poorly drained areas. A fourth type is forest that grows where abandoned fields and pastures are reforesting themselves naturally.

Old-growth hardwood forests.—These forests grow almost entirely on a few large estates in the better agricultural areas of the county. Their area is small. The dominant trees are white, red, and chestnut oaks. In some places considerable yellow-poplar and locust and some black walnut grow.

These forests have not been exploited; their esthetic and sentimental value to their owners is greater than the value of their timber. Many of the trees are mature or overmature. Under economic forest management, these old trees should be marketed to make way for growth of younger trees.

Cutover forests.—Most of the forests of the county are of this type. Most or nearly all of the merchantable timber has been removed. Those areas that are well protected from fire and grazing, especially in the State and National parks and forests, are increasing in value as the cut timber is being replaced by younger trees. Besides timber, these forests are valuable for watershed protection and wildlife shelter.

The composition of these forests varies considerably because their history of cutting varies. Oaks are the dominant species. The secondary species are hickories, elms, locust, maples, and dogwood. Short-leaf pine and scrub Virginia pine grow on some of the poorer land. A few hemlock trees are in the mountains.

The farm woodlots vary in composition and in degree of management. Many of them get little protection from fire or grazing.

Forests in poorly drained areas.—These forests grow in poorly drained areas on the uplands and on some of the flood plains of streams. Almost all of them have been cut over, but they consist of entirely different species of trees from those in the cutover forests of the drier areas. Pin oak and scarlet oak are common species, and hickories, swamp maple and other maples, some elms, birches, and many willows are part of the stand. Some areas have an undergrowth or a fairly pure stand of scrubby alders.

These are not very important forests in this county. They furnish some fenceposts, and most of them are good wildlife shelter. Many of these forests have been thinned out for pasture development. Only enough trees to provide shade for livestock have been left.

Forests in abandoned areas.—Most of these forests are in small spots in mountain and intermountain areas where cultivated fields and pastures have been abandoned and allowed to revert to forest after they became too eroded to support crops or good pastures. Under natural revegetation, such plants as blackberry, sassafras, persimmon, hawthorn, and locust usually establish themselves first. In time these plants are followed by oaks, hickories, dogwood, and other trees. Some of the poorer soils have some scrub Virginia pine.

Forests of this type should receive regular forest management if the trees have already established themselves. Those fields that are still in the brushy stage should be replanted with profitable species of trees. They should be protected from fire and grazing.

Forest Management

Protection from fire is very important in managing forests. The Maryland Department of Forests and Parks helps with this protection by providing a district forester and a full-time forest ranger. Three fire lookout towers are manned by temporary employees in critical seasons. All of these towers have telephones, and two have radio communication. Several crews of volunteer fire-control workers, headed by volunteer fire wardens, are paid by the Maryland Department of Forests and Parks for the time spent on control of fires, and this agency provides the pumps, rakes, shovels, axes, and other hand tools used. The activities of the permanent and volunteer fire-control personnel are coordinated by radio and by telephone.

Two fire trucks, one jeep, and one car used for fire control have radio communication. These vehicles carry portable pumps and hand tools and also some water.

Forests should be protected by fencing against grazing by cattle and other livestock. The browsing of livestock destroys many seedlings and damages young trees and some older trees. Livestock trample the soil and compact the surface, especially when it is

[2] This section was written with the assistance of Jack Karnig, at that time assistant district forester for Frederick County, Maryland Department of Forests and Parks.

wet. As a result, little rainfall is absorbed. The excessive runoff causes rather severe erosion, even in fairly thick forest stands. The soil cannot be used economically both for pasture and for forest, because the forest can neither maintain nor reproduce itself when pastured. Areas that have been partly cleared for grazing should no longer be considered as forest, even though many trees remain.

Assistance in management of forests and woodlots can be obtained free of charge from the assistant district forester through the office of the county agent. He can be asked to help mark trees for harvesting. About 30 acres of trees can usually be marked in a day. The first day of such marking is free of charge, but additional time must be paid for.

When forested land is to be cleared for other purposes, the assistant district forester can advise on marketing the wood products to recover the cost of clearing or make a profit. His office lists registered timber buyers who will bid on timber offered for sale.

Reforestation

Reforestation has been slow in Frederick County. In an average year, about 200 to 250 acres have been planted with forest seedlings. Thousands of acres more should be reforested because forestry is a more profitable enterprise on these particular soils than cropping.

Mountains and ridges, especially the upper slopes and stony areas, are the most suitable areas for reforestation. General soil areas that are most important for forestry are the Dekalb-Clymer, Edgemont-Dekalb, Edgemont-Chandler-Dekalb, Chandler-Talladega, and Highfield-Fauquier areas. The Myersville-Fauquier-Catoctin, Braddock-Thurmont-Augusta, and Cardiff general soil areas are used mostly for crops and pastures, but the rougher and more eroded places within them are especially suitable for reforestation.

More than 14,000 acres of soils in the better agricultural areas should be forested because they have been so eroded that they are unsuitable for crops and hardly suitable even for pasture. Soils that were formerly valuable but are now suitable only for forestry are the severely eroded units of the Myersville, Fauquier, Glenelg, and Highfield series. Less valuable agricultural soils that have many severely eroded areas now suitable only for forestry belong to the Lehigh, Braddock, Brandywine, Cardiff, Catoctin, Linganore, Manor, and Penn series. Although other soils of the county might support better forests than those of the general soil areas named, the other soils are more valuable for crops and pasture than for forest.

The tree most strongly recommended for reforestation, especially on the better soils, is white pine. Other suitable species are Scotch pine, Norway spruce, white spruce, larch, black locust, yellow-poplar, and loblolly pine. Red pine is suitable for higher elevations in the mountains. Virginia pine is suitable only for extremely poor sites, where other trees can hardly grow.

The recommended planting season for all available kinds of forest seedlings is from about March 1 to April 15 in Frederick County. Plans for reforestation should be discussed well ahead of time with the assistant district forester.

Seedlings of the trees mentioned are furnished free of charge to farmers who are reforesting for conservation purposes. The assistant district forester will plan and supervise the operation. Planting of seedlings on areas larger than 5 acres can be done by machine if the site is suitable. This planting is done for the landowner at a nominal cost for the use of the machine.

Descriptions of the Soils

This section is for those who wish to know just what the soil in any particular area of Frederick County is like. The soils of the county are classified into soil series and mapping units. The soils that are similar in arrangement, thickness, and general characteristics of their layers, except that they differ in texture of the surface layer, are grouped in soil series. The mapping units are separated according to differences in slope, degree of erosion, or other significant characteristics.

The mapping units have been given names that show the series, the texture of the surface soil, the slope, and the degree of erosion if it is moderate or severe. If erosion is not indicated in the mapping unit name, it means that the soil has had little or no erosion. Areas that have little true soil are not identified by series, but are given such names as Alluvial land or Rough stony land to identify the miscellaneous land type.

In this section the soil series of the county are described in detail, and each of the soils in each series is then described. The location and distribution of the individual soils are shown on the soil map in the back of this report. The approximate acreage and proportionate extent of each soil are given in table 3.

TABLE 3.—*Approximate acreage and proportionate extent of the soils mapped*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Alluvial land	1,104	0.3	Chalfont silt loam, 0 to 3 percent slopes	61	(1)
Athol gravelly loam, 0 to 3 percent slopes	1,055	.2	Chalfont silt loam, 3 to 15 percent slopes	322	0.1
Athol gravelly loam, 3 to 8 percent slopes, moderately eroded	4,656	1.1	Chandler and Talladega channery loams, 0 to 10 percent slopes, moderately eroded	644	.2
Athol gravelly loam, 8 to 15 percent slopes, moderately eroded	643	.2	Chandler and Talladega channery loams, 10 to 20 percent slopes, moderately eroded	950	.2
Athol gravelly loam, 15 to 25 percent slopes, moderately eroded	119	(1)	Chandler and Talladega channery loams, 20 to 35 percent slopes, moderately eroded	337	.1
Athol rocky loam, 0 to 15 percent slopes, moderately eroded	366	.1	Chandler and Talladega channery loams, 20 to 35 percent slopes, severely eroded	286	.1
Augusta gravelly loam, 0 to 3 percent slopes	1,674	.4	Chandler and Talladega channery loams, 35 to 45 percent slopes, moderately eroded	101	(1)
Augusta gravelly loam, 3 to 15 percent slopes, moderately eroded	887	.2	Chandler and Talladega silt loams, 0 to 10 percent slopes, moderately eroded	1,409	.3
Augusta silt loam, 0 to 8 percent slopes	151	(1)	Chandler and Talladega silt loams, 10 to 20 percent slopes, moderately eroded	1,198	.3
Augusta very stony loam, 0 to 8 percent slopes	315	.1	Chandler and Talladega silt loams, 20 to 35 percent slopes, moderately eroded	189	(1)
Bermudian fine sandy loam, 0 to 3 percent slopes	195	(1)	Chandler and Talladega silt loams, 20 to 35 percent slopes, severely eroded	338	.1
Bermudian silt loam, 0 to 3 percent slopes	1,310	.3	Chandler and Talladega very stony loams, 0 to 20 percent slopes, moderately eroded	1,689	.4
Birdsboro silt loam, 0 to 3 percent slopes	762	.2	Chandler and Talladega very stony loams, 20 to 45 percent slopes, moderately eroded	1,522	.4
Birdsboro silt loam, 3 to 8 percent slopes, moderately eroded	436	.1	Chester loam, 0 to 3 percent slopes, moderately eroded	104	(1)
Bowmansville silt loam, 0 to 8 percent slopes	580	.1	Chester loam, 3 to 8 percent slopes, moderately eroded	1,415	.3
Braddock cobbly loam, 3 to 8 percent slopes	457	.1	Chester loam, 8 to 15 percent slopes, moderately eroded	240	.1
Braddock gravelly loam, 3 to 8 percent slopes, moderately eroded	1,781	.4	Chewacla silt loam, 0 to 3 percent slopes	7,884	1.9
Braddock gravelly and cobbly loams, 8 to 15 percent slopes, moderately eroded	677	.2	Clymer very stony loam, 0 to 20 percent slopes	1,446	.3
Braddock very stony loam, 3 to 15 percent slopes	137	(1)	Colbert silt loam, deep variant, 0 to 3 percent slopes	342	.1
Braddock soils, 15 to 25 percent slopes, moderately eroded	88	(1)	Conestoga silt loam, 0 to 8 percent slopes, moderately eroded	1,842	.4
Brandywine gravelly loam, 0 to 15 percent slopes, moderately eroded	875	.2	Conestoga silt loam, 8 to 15 percent slopes, moderately eroded	773	.2
Brandywine gravelly loam, 15 to 25 percent slopes, moderately eroded	239	.1	Conestoga silt loam, 15 to 25 percent slopes, moderately eroded	191	(1)
Brandywine gravelly loam, 15 to 55 percent slopes, severely eroded	390	.1	Congaree silt loam, 0 to 3 percent slopes	1,374	.3
Bucks silt loam, 0 to 3 percent slopes	147	(1)	Congaree silt loam, local alluvium, 0 to 3 percent slopes	400	.1
Bucks silt loam, 3 to 8 percent slopes, moderately eroded	62	(1)	Congaree silt loam, local alluvium, 3 to 8 percent slopes	814	.2
Captina silt loam, 0 to 8 percent slopes, moderately eroded	124	(1)	Croton silt loam, overwashed, 0 to 8 percent slopes	4,132	1.0
Cardiff channery loam, 0 to 8 percent slopes, moderately eroded	3,410	.8	Dekalb loam, 0 to 10 percent slopes, moderately eroded	101	(1)
Cardiff channery loam, 8 to 15 percent slopes, moderately eroded	1,730	.4	Dekalb loam, 10 to 20 percent slopes, moderately eroded	81	(1)
Cardiff channery loam, 8 to 15 percent slopes, severely eroded	776	.2	Dekalb very stony loam, 0 to 35 percent slopes	3,199	.8
Cardiff channery loam, 15 to 25 percent slopes, moderately eroded	855	.2	Duffield silt loam, 0 to 3 percent slopes	3,091	.7
Cardiff channery loam, 15 to 25 percent slopes, severely eroded	681	.2	Duffield and Frankstown silt loams, 0 to 3 percent slopes	659	.2
Cardiff channery loam, 25 to 45 percent slopes, moderately eroded	466	.1	Duffield and Frankstown silt loams, 3 to 8 percent slopes, moderately eroded	13,132	3.1
Cardiff channery loam, 45 to 55 percent slopes, moderately eroded	294	.1	Duffield and Frankstown silt loams, 8 to 15 percent slopes, moderately eroded	1,091	.3
Cardiff channery loam, 15 to 55 percent slopes, very severely eroded	723	.2	Duffield and Frankstown silt loams, 15 to 25 percent slopes, moderately eroded	238	.1
Catoctin channery silt loam, 0 to 10 percent slopes, moderately eroded	126	(1)	Duffield and Frankstown shaly silt loams, 0 to 3 percent slopes, moderately eroded	185	(1)
Catoctin channery silt loam, 10 to 20 percent slopes, moderately eroded	165	(1)	Duffield and Frankstown shaly silt loams, 3 to 8 percent slopes, moderately eroded	908	.2
Catoctin channery silt loam, 10 to 20 percent slopes, severely eroded	188	(1)	Duffield and Frankstown shaly silt loams, 8 to 15 percent slopes, moderately eroded	325	.1
Catoctin channery silt loam, 20 to 35 percent slopes, moderately eroded	227	.1			
Catoctin channery silt loam, 20 to 35 percent slopes, severely eroded	863	.2			
Catoctin channery silt loam, 20 to 55 percent slopes, very severely eroded	1,179	.3			
Catoctin channery silt loam, 35 to 55 percent slopes, moderately eroded	424	.1			

TABLE 3.—*Approximate acreage and proportionate extent of the soils mapped*—Continued

Soil	Area	Extent
	Acres	*Percent*
Edgemont gravelly loam, 0 to 8 percent slopes, moderately eroded	286	0.1
Edgemont gravelly loam, 8 to 15 percent slopes, moderately eroded	594	.1
Edgemont gravelly loam, 15 to 25 percent slopes, moderately eroded	263	.1
Edgemont gravelly loam, 25 to 45 percent slopes	49	(1)
Edgemont very stony loam, 0 to 20 percent slopes	640	.2
Edgemont very stony loam, 20 to 60 percent slopes	348	.1
Edgemont-Chandler channery loams, 0 to 10 percent slopes, moderately eroded	854	.2
Edgemont-Chandler channery loams, 10 to 20 percent slopes, moderately eroded	632	.1
Edgemont-Chandler channery loams, 10 to 20 percent slopes, severely eroded	105	(1)
Edgemont-Chandler channery loams, 20 to 35 percent slopes, moderately eroded	199	(1)
Edgemont-Chandler channery loams, 20 to 35 percent slopes, severely eroded	130	(1)
Edgemont-Chandler very stony loams, 0 to 20 percent slopes	8,525	2.0
Edgemont-Chandler very stony loams, 20 to 60 percent slopes	9,642	2.3
Elioak gravelly loam, 3 to 8 percent slopes, moderately eroded	79	(1)
Elioak gravelly loam, 8 to 15 percent slopes, moderately eroded	38	(1)
Elioak silt loam, 0 to 3 percent slopes, moderately eroded	137	(1)
Elioak silt loam, 3 to 8 percent slopes, moderately eroded	213	.1
Elk gravelly loam, 3 to 8 percent slopes, moderately eroded	349	.1
Elk loam, 0 to 3 percent slopes	311	.1
Elk loam, 3 to 8 percent slopes, moderately eroded	522	.1
Elk loam, 8 to 15 percent slopes, moderately eroded	73	(1)
Fauquier gravelly loam, 0 to 3 percent slopes	215	.1
Fauquier gravelly loam, 3 to 10 percent slopes, moderately eroded	3,543	.8
Fauquier gravelly loam, 10 to 20 percent slopes, moderately eroded	1,728	.4
Fauquier gravelly loam, 20 to 35 percent slopes, moderately eroded	489	.1
Fauquier gravelly loam, 20 to 45 percent slopes, severely eroded	246	.1
Fauquier loam, 0 to 3 percent slopes	231	.1
Fauquier loam, 3 to 8 percent slopes, moderately eroded	1,158	.3
Fauquier loam, 8 to 15 percent slopes, moderately eroded	772	.2
Fauquier loam, shallow, 8 to 15 percent slopes, moderately eroded	73	(1)
Fauquier loam, shallow, 15 to 45 percent slopes, moderately eroded	215	.1
Fauquier silt loam, 0 to 3 percent slopes	429	.1
Fauquier silt loam, 0 to 10 percent slopes, moderately eroded	4,494	1.1
Fauquier silt loam, 10 to 20 percent slopes, moderately eroded	4,373	1.0
Fauquier silt loam, 20 to 35 percent slopes, moderately eroded	851	.2
Fauquier silty clay loam, 10 to 20 percent slopes, very severely eroded	94	(1)
Fauquier silty clay loam, 20 to 35 percent slopes, severely eroded	574	.1
Fauquier silty clay loam, 20 to 45 percent slopes, very severely eroded	65	(1)
Fauquier very stony loam, 0 to 20 percent slopes, moderately eroded	2,371	0.6
Fauquier very stony loam, 20 to 50 percent slopes, moderately eroded	1,939	.5
Glenelg gravelly loam, 0 to 8 percent slopes, moderately eroded	6,899	1.6
Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded	3,775	.9
Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded	764	.2
Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded	747	.2
Glenelg gravelly loam, 15 to 45 percent slopes, very severely eroded	237	.1
Glenelg and Chester loams, 3 to 8 percent slopes, moderately eroded	1,323	.3
Glenelg and Chester loams, 8 to 15 percent slopes, moderately eroded	576	.1
Glenelg and Chester loams, 15 to 25 percent slopes, moderately eroded	138	(1)
Glenelg and Chester silt loams, 0 to 3 percent slopes, moderately eroded	242	.1
Glenelg and Chester silt loams, 3 to 8 percent slopes, moderately eroded	3,553	.8
Glenelg and Chester silt loams, 8 to 15 percent slopes, moderately eroded	1,073	.3
Glenelg and Chester silt loams, 15 to 45 percent slopes, moderately eroded	276	.1
Glenville silt loam, 0 to 8 percent slopes	3,153	.7
Glenville silt loam, 3 to 8 percent slopes, moderately eroded	467	.1
Glenville very stony silt loam, 0 to 8 percent slopes	295	.1
Guthrie silt loam, 0 to 3 percent slopes	131	(1)
Hagerstown gravelly loam, 0 to 3 percent slopes	385	.1
Hagerstown gravelly loam, 3 to 8 percent slopes, moderately eroded	2,564	.6
Hagerstown gravelly loam, 8 to 15 percent slopes, moderately eroded	640	.2
Hagerstown loam, 0 to 3 percent slopes	1,533	.4
Hagerstown loam, 0 to 8 percent slopes, moderately eroded	6,217	1.5
Hagerstown loam, 8 to 15 percent slopes, moderately eroded	1,088	.3
Hagerstown loam, 15 to 25 percent slopes, moderately eroded	187	(1)
Hagerstown rocky clay, 8 to 15 percent slopes, severely eroded	192	(1)
Hagerstown rocky clay, 15 to 25 percent slopes, severely eroded	29	(1)
Hagerstown rocky loam, 3 to 15 percent slopes, moderately eroded	1,226	.3
Hagerstown silt loam, 0 to 3 percent slopes	186	(1)
Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded	1,371	.3
Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded	304	.1
Highfield channery loam, 0 to 10 percent slopes, moderately eroded	4,234	1.0
Highfield channery loam, 10 to 20 percent slopes, moderately eroded	4,755	1.1
Highfield channery loam, 20 to 35 percent slopes, moderately eroded	1,683	.4
Highfield channery loam, 20 to 35 percent slopes, severely eroded	747	.2
Highfield channery loam, 20 to 35 percent slopes, very severely eroded	190	(1)
Highfield channery loam, 35 to 45 percent slopes, moderately and severely eroded	183	(1)
Highfield silt loam, 0 to 10 percent slopes, moderately eroded	312	.1

TABLE 3.—*Approximate acreage and proportionate extent of the soils mapped*—Continued

Soil	Area	Extent
	Acres	*Percent*
Highfield silt loam, 10 to 20 percent slopes, moderately eroded	335	0.1
Highfield silt loam, 20 to 35 percent slopes, severely eroded	244	.1
Highfield very stony loam, 0 to 20 percent slopes	7,109	1.7
Highfield very stony loam, 20 to 45 percent slopes	10,912	2.6
Huntington fine sandy loam, 0 to 3 percent slopes	736	.2
Huntington silt loam, 0 to 3 percent slopes	2,714	.6
Huntington silt loam, local alluvium, 0 to 3 percent slopes	527	.1
Lantz silt loam, 0 to 8 percent slopes	909	.2
Lantz very stony loam, 0 to 15 percent slopes	688	.2
Legore gravelly silty clay loam, 0 to 15 percent slopes, moderately eroded	504	.1
Legore gravelly silty clay loam, 15 to 25 percent slopes, moderately eroded	73	(1)
Legore silty clay loam, 0 to 15 percent slopes, moderately eroded	161	(1)
Legore very stony clay loam, 0 to 15 percent slopes	303	.1
Legore very stony clay loam, 15 to 50 percent slopes	121	(1)
Lehigh slaty loam, 3 to 15 percent slopes, moderately eroded	933	2
Lehigh slaty silty clay loam, 3 to 15 percent slopes, very severely eroded	142	(1)
Lindside silt loam, 0 to 3 percent slopes	2,278	.5
Lindside silt loam, local alluvium, 0 to 3 percent slopes	2,616	.6
Lindside silt loam, local alluvium, 3 to 8 percent slopes	114	(1)
Linganore channery and gravelly loams, 0 to 15 percent slopes, moderately eroded	8,069	1.9
Linganore channery and gravelly loams, 15 to 25 percent slopes, moderately eroded	1,870	.4
Linganore channery and gravelly silt loams, 3 to 15 percent slopes, severely eroded	762	.2
Linganore channery and gravelly silt loams, 15 to 25 percent slopes, severely and very severely eroded	1,929	.5
Linganore channery and gravelly silt loams, 25 to 55 percent slopes, severely eroded	1,800	.4
Linganore very stony loam, 3 to 55 percent slopes	328	.1
Manor channery and gravelly loams, 0 to 8 percent slopes, moderately eroded	17,796	4.2
Manor channery and gravelly loams, 8 to 15 percent slopes, moderately eroded	24,543	5.8
Manor channery and gravelly loams, 8 to 15 percent slopes, severely eroded	2,618	.6
Manor channery and gravelly loams, 15 to 25 percent slopes, moderately eroded	9,181	2.2
Manor channery and gravelly loams, 15 to 25 percent slopes, severely eroded	6,424	1.5
Manor channery and gravelly loams, 15 to 25 percent slopes, very severely eroded	338	.1
Manor channery and gravelly loams, 25 to 45 percent slopes, moderately eroded	2,335	.5
Manor channery and gravelly loams, 25 to 55 percent slopes, severely and very severely eroded	1,729	.4
Manor very stony loam, 3 to 15 percent slopes	390	.1
Manor very stony loam, 15 to 55 percent slopes	457	.1
Melvin silt loam, 0 to 3 percent slopes	933	.2
Montalto silty clay loam, 0 to 8 percent slopes, moderately eroded	208	(1)
Montalto silty clay loam, 8 to 15 percent slopes, moderately eroded	227	.1
Montalto silty clay loam, 15 to 25 percent slopes, moderately eroded	43	(1)
Montalto very stony clay loam, 0 to 15 percent slopes, moderately eroded	786	0.2
Montalto very stony clay loam, 15 to 45 percent slopes	191	(1)
Myersville and Fauquier clay loams, 15 to 25 percent slopes, very severely eroded	1,165	.3
Myersville and Fauquier gravelly loams, 0 to 3 percent slopes	97	(1)
Myersville and Fauquier gravelly loams, 3 to 8 percent slopes, moderately eroded	267	.1
Myersville and Fauquier gravelly loams, 8 to 15 percent slopes, moderately eroded	233	.1
Myersville and Fauquier loams, 0 to 3 percent slopes	1,590	.4
Myersville and Fauquier loams, 3 to 8 percent slopes, moderately eroded	8,001	1.9
Myersville and Fauquier loams, 8 to 15 percent slopes, moderately eroded	6,385	1.5
Myersville and Fauquier loams, 15 to 25 percent slopes, moderately eroded	2,093	.5
Myersville and Fauquier loams, 25 to 45 percent slopes, moderately eroded	877	.2
Myersville and Fauquier loams, 25 to 50 percent slopes, severely eroded	244	.1
Myersville and Fauquier silt loams, 0 to 3 percent slopes	281	.1
Myersville and Fauquier silt loams, 0 to 3 percent slopes, moderately eroded	2,602	.6
Myersville and Fauquier silt loams, 8 to 15 percent slopes, moderately eroded	3,222	.8
Myersville and Fauquier silt loams, 15 to 25 percent slopes, moderately eroded	1,245	.3
Myersville and Fauquier silty clay loams, 8 to 15 percent slopes, severely eroded	273	.1
Myersville and Fauquier very stony loams, 3 to 35 percent slopes	151	(1)
Myersville and Fauquier very stony loams, 35 to 50 percent slopes	328	.1
Norton gravelly silt loam, 0 to 3 percent slopes	557	.1
Norton gravelly silt loam, 3 to 8 percent slopes, moderately eroded	1,345	.3
Norton gravelly silt loam, 8 to 15 percent slopes, moderately eroded	282	.1
Norton gravelly silt loam, 15 to 25 percent slopes, moderately eroded	51	(1)
Norton gravelly silt loam, 25 to 45 percent slopes, moderately eroded	97	(1)
Norton very stony loam, 3 to 8 percent slopes	116	(1)
Penn gravelly loam, 0 to 8 percent slopes, moderately eroded	2,494	.6
Penn gravelly loam, 0 to 8 percent slopes, severely eroded	59	(1)
Penn gravelly loam, 8 to 15 percent slopes, moderately eroded	823	.2
Penn gravelly loam, 8 to 15 percent slopes, severely eroded	755	.2
Penn gravelly loam, 15 to 25 percent slopes, moderately eroded	142	(1)
Penn loam, 0 to 8 percent slopes, moderately eroded	3,721	.9
Penn loam, 8 to 15 percent slopes, moderately eroded	1,049	.2
Penn loam, 8 to 15 percent slopes, severely eroded	488	.1
Penn loam, 15 to 25 percent slopes, moderately eroded	154	(1)
Penn loam and gravelly loam, 15 to 25 percent slopes, severely eroded	1,004	.2
Penn shaly loam, 0 to 15 percent slopes, moderately eroded	10,381	2.4

TABLE 3.—*Approximate acreage and proportionate extent of the soils mapped*—Continued

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Penn shaly loam, 3 to 15 percent slopes, severely eroded	2,542	0.6	Rohrersville silt loam, 3 to 15 percent slopes, moderately eroded	271	0.1
Penn shaly loam, 15 to 25 percent slopes, moderately eroded	309	.1	Rough stony land	15,622	3.7
Penn shaly loam, 15 to 25 percent slopes, severely eroded	1,119	.3	Rowland silt loam, 0 to 3 percent slopes	2,062	.5
Penn silt loam, 0 to 8 percent slopes, moderately eroded	18,107	4.3	Sequatchie sandy loam, neutral variant, 3 to 8 percent slopes, moderately eroded	415	.1
Penn silt loam, 3 to 8 percent slopes, severely eroded	250	.1	Sequatchie sandy loam, neutral variant, 8 to 15 percent slopes, moderately eroded	164	(1)
Penn silt loam, 8 to 15 percent slopes, moderately eroded	871	.2	Thurmont cobbly loam, 0 to 8 percent slopes	541	.1
Penn silt loam, 8 to 15 percent slopes, severely eroded	810	.2	Thurmont gravelly loam, 0 to 8 percent slopes, moderately eroded	2,649	.6
Penn soils, 3 to 8 percent slopes, very severely eroded	88	(1)	Thurmont gravelly loam, 8 to 15 percent slopes, moderately eroded	407	.1
Penn soils, 8 to 15 percent slopes, very severely eroded	804	.2	Thurmont gravelly loam, 15 to 25 percent slopes, moderately eroded	90	(1)
Penn soils, 15 to 25 percent slopes, very severely eroded	353	.1	Thurmont gravelly and cobbly loams, 0 to 3 percent slopes	308	.1
Penn soils, 25 to 50 percent slopes, moderately eroded	447	.1	Thurmont silt loam, 0 to 3 percent slopes	187	(1)
Penn soils, 25 to 50 percent slopes, severely eroded	308	.1	Thurmont very stony loam, 0 to 15 percent slopes	1,150	.3
Penn-Lansdale loams, 0 to 8 percent slopes, moderately eroded	1,464	.3	Urbana silt loam, 0 to 3 percent slopes	355	.1
Penn-Lansdale loams, 8 to 15 percent slopes, moderately eroded	133	(1)	Urbana silt loam, 3 to 15 percent slopes, moderately eroded	3,145	.7
Penn-Lansdale loams, 8 to 15 percent slopes, severely eroded	246	.1	Urbana silt loam, 8 to 15 percent slopes, severely eroded	119	(1)
Penn-Lansdale loams, 15 to 25 percent slopes, moderately eroded	152	(1)	Urbana silt loam, 15 to 25 percent slopes, moderately eroded	64	(1)
Penn-Lansdale loams, 15 to 25 percent slopes, severely eroded	124	(1)	Watchung silt loam, 0 to 8 percent slopes	359	.1
Raritan silt loam, 0 to 3 percent slopes	352	.1	Waynesboro gravelly loam, 0 to 8 percent slopes, moderately eroded	314	.1
Raritan silt loam, 3 to 8 percent slopes, moderately eroded	113	(1)	Waynesboro gravelly loam, 8 to 15 percent slopes, moderately eroded	204	(1)
Readington silt loam, 0 to 3 percent slopes	3,476	.8	Wehadkee silt loam, 0 to 3 percent slopes	6,643	1.6
Readington silt loam, 0 to 8 percent slopes, moderately eroded	2,133	.5	Worsham silt loam, 0 to 8 percent slopes	2,009	.5
Roanoke silt loam, moderately deep over cobbles, 0 to 3 percent slopes	980	.2	Worsham very stony silt loam, 0 to 8 percent slopes	549	.1
Rohrersville silt loam, 0 to 8 percent slopes	1,044	.2	Made land	161	(1)
			Mine dumps	5	(1)
			Quarries and gravel pits	120	(1)
			Land total	424,960	100.0
			Water	3,840	
			Total	428,800	

[1] Less than 0.1 percent.

Alluvial Land

This land type occurs as narrow strips on the alluvial flood plains along small streams in the mountains or where the streams discharge into the valleys. The soil material ranges widely in depth, texture, drainage, permeability, and stoniness. Differences may occur within short distances. The fertility is generally rather low. Most of the acreage is in forest or pasture.

Alluvial land (Aa).—This mapping unit is rather shallow and somewhat poorly drained. In many places it is gravelly or cobbly. Most of it is nearly level, but seepage areas along foot slopes at the edge of the flood plains are steeper. The variations in slope are not important, because most of the acreage is in pasture or woods. This land type is in capability unit Vw–1.

Athol Series

The soils of the Athol series are gravelly or rocky, deep, and well drained. They developed from material weathered from cemented conglomerate consisting of limestone fragments in a hard matrix of red shale, sandstone, or both.

In color, the Athol soils resemble the Penn soils, with which they are associated, but they are neutral or slightly alkaline instead of strongly acid. They are much deeper than the Penn soils and have greater moisture-supplying capacity. In productivity and management needs, the Athol soils are more like the soils of the Hagerstown and Duffield series.

Athol soils are fairly extensive in Frederick County. They occur in two parts of the county: One is the Frederick Valley, in places where the underlying limestone merges with shale and sandstone, and the other

is a long, rather narrow strip extending from Braddock southwest to the Potomac River just east of Point of Rocks.

The following profile of Athol gravelly loam is in an idle area about 2 miles west of Frederick and just east of the intersection of United States Highways No. 40 and Alternate No. 40.

Surface soil—

A_p 0 to 6 inches, dark reddish-brown (5YR 3/4)[3] fine gravelly loam; strong, coarse, crumb structure; moderately hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many pores of all sizes; contains about 30 percent fine sandstone and chert gravel; mildly alkaline; clear smooth boundary; 6 to 8 inches thick.

Subsoil—

B_1 6 to 14 inches, yellowish-red (5YR 5/6) fine gravelly silty clay loam; strong, medium, subangular blocky structure; hard when dry, moderately firm when moist, and plastic and sticky when wet; roots plentiful in upper part; many fine and some medium pores; between 20 and 30 percent fine gravel; mildly alkaline; gradual wavy boundary; 6 to 12 inches thick.

B^2 14 to 32 inches, dark reddish-brown (2.5YR 3/4) fine gravelly clay loam; strong, medium, subangular blocky structure; hard when dry, firm when moist, and plastic and sticky when wet; roots very few; many fine and some medium pores; about 40 percent fine and very fine gravel; neutral; gradual irregular boundary; 12 to 26 inches thick.

Substratum—

C_1 32 to 50 inches, dark reddish-brown (2.5YR 3/4) pebbles of sandstone, hard shale, and chert, weakly cemented in a clay matrix; hard to very hard when dry, very firm and brittle when moist, and sticky when wet (crushed); no roots; few pores; mildly alkaline; gradual irregular boundary; 15 to 30 inches thick.

C_2 50 to 56 inches, dark reddish-brown fine gravelly sandy loam, containing much friable red sandstone; moderately hard when dry, friable when moist, and plastic and sticky when wet; no roots; moderately permeable; calcareous and moderately alkaline; abrupt broken boundary; 6 to 10 inches thick.

D_r 56 inches +, hard basal limestone breccia; sharply angular limestone fragments up to 2 inches in length, firmly cemented in a matrix of hard, red, Triassic material.

In some places this soil is a little less red than in the profile described, particularly in places where the underlying conglomerate merges with limestone that contains no red shale. The gravel is coarse to very fine. The finer gravel is mostly in the redder areas. Depth to bedrock varies greatly. Most areas are at least 30 inches deep, but outcrops of limestone conglomerate or breccia are common in some places.

Athol gravelly loam, 0 to 3 percent slopes (AbA).—This is a productive soil, and practically all of it is in crops or high-quality pasture. There has been very little erosion. This soil is in capability unit I–1.

Athol gravelly loam, 3 to 8 percent slopes, moderately eroded (AbB2).—Most of this soil is productive and easy to manage. It needs only reasonable care to protect it from further erosion. Included are 78 acres that are more severely eroded and need more careful management. This soil is in capability unit IIe–1.

Athol gravelly loam, 8 to 15 percent slopes, moderately eroded (AbC2).—This soil is highly productive. Although it has a more serious erosion hazard than the more nearly level Athol soils, it is not severely eroded. Most of it has been well managed and protected. It is in capability unit IIIe–1.

Athol gravelly loam, 15 to 25 percent slopes, moderately eroded (AbD2).—This soil should be used for long rotations that include only an occasional cultivated crop, or it should be kept in pasture. It is in capability unit IVe–1. Included are 4 acres that have slopes of more than 25 percent; this acreage should be kept in sod or planted to trees.

Athol rocky loam, 0 to 15 percent slopes, moderately eroded (AcB2).—This soil has massive outcrops of limestone conglomerate or breccia, close enough together to prevent normal cultivation. From 10 to 20 percent of the surface area consists of rock. A single rock outcrop may cover as much as an acre. It is possible but generally not convenient to cultivate between the outcrops. Pasture and some hay are the best uses for this soil. It is in capability unit VIs–1.

Augusta Series

The Augusta series consists of moderately deep, moderately well drained soils that are weakly to moderately well developed. They occur on old alluvial terraces and also on low, fanlike deposits of colluvial materials. The colluvial and alluvial materials from which they developed consist of gravelly to stony debris derived from metabasalt, quartzite, and sandstone.

The Augusta soils are moderately extensive in Frederick County. They occur mainly on the eastern colluvial foot slopes of Catoctin Mountain and on terraces within and downstream from the colluvial fans. The following profile of Augusta very stony loam was observed in a forested area on Brice Road, five-eighths of a mile north of Kelleys Store Road, just northeast of Catoctin Furnace.

Surface soil—

A_1 0 to 1 inch, black (10YR 2/1) very stony loam; moderate, fine, crumb to granular structure; slightly hard when dry, very friable when moist, and nonplastic and nonsticky when wet; roots abundant; many pores of all sizes; very strongly acid; abrupt wavy boundary; ¼ to 1 inch thick.

A_2 1 to 8 inches, light olive-brown (2.5Y 5/4) stony loam to stony light silt loam; moderate, medium, crumb structure; hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots fairly plentiful; many medium and some small and large pores; strongly acid; clear irregular boundary; 4 to 8 inches thick.

Subsoil—

B_{21} 8 to 23 inches, light olive-brown (2.5Y 5/6) stony and gritty heavy silt loam; weak, medium, blocky structure; very hard when dry, somewhat firm when moist, and plastic and sticky when wet; roots few; many fine and medium pores; grit consists of coarse and very coarse quartzite sand; strongly acid; gradual very irregular boundary; 12 to 20 inches thick.

B_{22g} 23 to 31 inches, light olive-brown (2.5Y 5/6) stony and gritty heavy silt loam to silty clay loam strongly streaked and mottled with pale olive and light gray (5Y 6/3 and 7/1); compound structure: weak, thick, platy and weak, fine, crumb to weak, very fine, subangular blocky; hard when dry, firm

[3] Soil colors are for moist soils, according to terminology in the Soil Survey Manuel (*8*); symbols following names are Munsell color notations of hue, value, and chroma.

and slightly brittle when moist, and plastic and sticky when wet; very few roots; many fine and some medium pores; grit consists of quartzite particles; very strongly acid; clear very irregular boundary; 8 to 12 inches thick.

Substratum—

CD_g 31 to 48 inches +, a mass of cobbles and stones, mainly of sandstone and metabasalt but with some quartzite; interstices filled with gritty sandy clay more or less evenly mottled with pale olive, pale yellow, and white.

The Augusta soils are moderately wet most of the time, but they have rather low moisture-supplying capacity and tend to be droughty in periods when the rainfall is scanty. They are difficult to manage because of the stones and gravel, but they are moderately fertile. The less gravelly areas are cropped and are fairly productive.

Augusta gravelly loam, 0 to 3 percent slopes (AdA).—The profile of this soil is like the one described, except that it is gravelly instead of stony. There has been little or no erosion. This soil is suitable for cultivation, but because of seasonal wetness it is in capability unit IIw–1.

Augusta gravelly loam, 3 to 15 percent slopes, moderately eroded (AdB2).—This soil has more rapid runoff than Augusta gravelly loam, 0 to 3 percent slopes. Erosion is more of a hazard than wetness. This soil is in capability unit IIIe–13.

Augusta silt loam, 0 to 8 percent slopes (AeB).—This soil is inextensive but is probably the best of the Augusta soils in Frederick County. It is in capability unit IIw–1 because impeded drainage affects its management more than the erosion hazard does. Included are 5 acres that are severely eroded.

Augusta very stony loam, 0 to 8 percent slopes (AgB).—The profile of this soil is described under the series. The soil is somewhat wet. It is so stony that cultivation is impossible and pasture management is difficult. It is in capability unit VIs–2.

Bermudian Series

The Bermudian soils are deep, well-drained soils on the flood plains. They consist of recently deposited fine materials washed chiefly from areas of red Penn and Readington soils. They are only moderately fertile but can be made and kept highly productive. They are fairly easy to manage. They are wet early in spring. They are flooded occasionally, but not so often as most flood-plain soils.

The following profile of Bermudian silt loam is in a cultivated area on the flood plain on the east side of the Monocacy River, 200 feet from the riverbank and about 300 feet south of Biggs Ford Road.

Surface soil—

1_p. 0 to 6 inches, reddish-brown (5YR 4/3) silt loam; weak, medium, crumb structure; hard when dry, friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and some medium and larger pores; medium acid; diffuse smooth boundary; 4 to 8 inches thick.

Subsoil—

2. 6 to 28 inches, reddish-brown (5YR 5/4) heavy silt loam to silty clay loam; weak, fine, crumb structure; hard to very hard when dry, friable to somewhat firm when moist, and plastic and sticky when wet; roots few; abundant very fine pores; a few mica flakes in lower part; medium acid; diffuse smooth boundary; 15 to 30 inches thick.
3. 28 to 48 inches +, yellowish-red (5YR 4/6) silty clay loam; weak, fine, crumb to granular structure; extremely hard when dry, firm when moist, and sticky and very plastic when wet; practically no roots; rather slowly permeable; few fine and medium pores; considerable mica; strongly acid.

In places the color is a little more intensely red and has a slight purple cast. Mica flakes are lacking in some places. Both runoff and internal drainage are rather slow but thorough. The moisture-supplying capacity is rather high.

Bermudian fine sandy loam, 0 to 3 percent slopes (BaA).—The profile of this soil is like that of Bermudian silt loam, except that it is sandier throughout. About 11 acres have slopes of more than 3 percent. This soil is in capability unit I–6.

Bermudian silt loam, 0 to 3 percent slopes (BbA).—The profile of this soil is described under the series. The soil is a little more productive and has greater moisture-supplying capacity than Bermudian fine sandy loam. This soil is in capability unit I–6. Eight acres have slopes of more than 3 percent and should be managed accordingly.

Birdsboro Series

The Birdsboro series consists of rather deep, well-drained soils that have developed on old alluvial terraces from fine materials washed from Penn and Readington soils. They are at higher elevations than the Bermudian soils and have better developed profiles. These soils are fairly fertile, and their moisture-supplying capacity is high. They are easy to manage and can be made and kept quite productive.

Birdsboro soils are not extensive in Frederick County. The following profile of Birdsboro silt loam was observed 200 yards north of the bend of Bollinger Church Road, five-eighths of a mile north of Harney Road. This is on a terrace where Marsh Creek crosses the Pennsylvania State line into Frederick County. At this point the vegetation was hardwood forest, dominantly hickories.

Surface soil—

A_1 0 to 1 inch, dark reddish-brown (5YR 2/2) silt loam; weak, fine, crumb structure; soft when dry, very friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many pores of all sizes; very strongly acid; clear smooth boundary; 1 to 3 inches thick.

A_2 1 to 5 inches, dark-brown (7.5YR 4/4) silt loam; moderate, fine, crumb structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and some larger pores; contains many waterworn pebbles; very strongly acid; clear smooth boundary; 2 to 5 inches thick.

Subsoil—

B_2 5 to 16 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and very plastic and very sticky when wet; very few roots; many fine but few larger pores; contains considerable waterworn gravel; extremely acid; gradual wavy boundary; 10 to 16 inches thick.

BC 16 to 30 inches, dark reddish-brown (5YR 3/4) gravelly silty clay loam; stratified; weak, thick,

platy structure; hard when dry, very firm but brittle when moist, and very plastic and very sticky when wet; no roots; many fine but few larger pores; horizon is transitional between subsoil and substratum; from 30 to 50 percent of the mass consists of waterworn quartz, sandstone, and shale gravel; extremely acid; very abrupt wavy boundary.

Substratum—

D_u 30 to 36 inches +, hard, red, Triassic shale.

In many places, these soils are deeper over the shale or other substrata than the profile described. In cultivated areas, the plow layer is almost exactly like the second layer, except that it is usually less acid because it has been limed. The intensity of the red color, the gravel content, and the depth vary.

Birdsboro silt loam, 0 to 3 percent slopes (BcA).—This soil occurs mostly on small terraces scattered throughout the northeastern part of the county. Some areas of this soil have considerable gravel on the surface and have a profile slightly less silty than the one described. This soil is in capability unit I–4.

Birdsboro silt loam, 3 to 8 percent slopes, moderately eroded (BcB2).—This soil will erode further unless carefully managed. Some areas are gravelly; these are shown on the soil map by gravel symbols. This soil is in capability unit IIe–4. Included are about 37 acres that have somewhat stronger slopes and should be managed accordingly.

Bowmansville Series

The Bowmansville series consists of poorly drained soils that occur on narrow flood plains. They have developed from fairly recent, fine-textured alluvium washed from red soils, chiefly of the Penn and Readington series. This is the same kind of parent material as that from which the well drained Bermudian soils and the moderately well drained Rowland soils have developed.

These soils are very wet during long rainy periods and after thaws, and they are frequently flooded. They are rather low in fertility. They are used mostly for pasture or woods.

The following profile of Bowmansville silt loam is in an unimproved pasture three-tenths of a mile east of the intersection of Lewistown Road and United States Highway No. 15, where Lewistown Road crosses Fishing Creek.

Surface soil—

A_1 0 to 6 inches, dark-brown (7.5YR 4/2) light silt loam with a noticeable amount of medium and fine sand; weak, coarse, crumb structure; hard when dry, friable when moist, and nonplastic and nonsticky when wet; roots plentiful; many pores of all sizes; slightly acid; gradual smooth boundary; 4 to 6 inches thick.

Subsoil—

B 6 to 25 inches, reddish-brown (5YR 4/3) sandy loam to loamy sand; moderate, medium, crumb structure to weak, medium, granular structure; hard when dry, friable when moist, and nonplastic but slightly sticky when wet; few roots; abundant pores, mostly medium; slightly acid; abrupt wavy boundary; 15 to 25 inches thick.

Substratum—

D 25 to 36 inches +, dark-gray (10YR 4/1) sand or loamy sand that has a few medium mottles and many streaks of strong brown; very weak, coarse, blocky structure superimposed on stratification; water-bearing stratum; moderately hard when dry; loose to very friable when moist; and soft and "soupy", with very low bulk density, but nonplastic and nonsticky when wet; no roots; rapidly permeable but usually saturated because of perched high water table; medium acid.

The texture varies. In some places the entire profile is silt loam. The color, particularly the amount and intensity of mottling, varies with the texture and with the depth to the water table.

Bowmansville silt loam, 0 to 8 percent slopes (BdB).—This is the only Bowmansville soil in the county. It includes a few spots that have a sandy loam or fine sandy loam surface texture, and 9 acres that have slopes of somewhat more than 8 percent. This soil is in capability unit VIw–1.

Braddock Series

The Braddock series consists of rather deep, well-drained, undulating to rolling, gravelly to stony soils that have developed on old rock slides or colluvial fans along the base of low mountains. The colluvial rock material is chiefly greenstone or metabasalt, mixed with some sandstone and quartzite. The Braddock soils are much more mature than the Thurmont soils, and they have better developed and more intensely colored profiles.

These are fertile soils that have moderate moisture-supplying capacity. Under good management they are moderately to highly productive. They are easy to manage, except that gravel or cobblestones interfere somewhat with farming operations. The less stony areas are widely used for crops, particularly orchard crops. The more stony areas are used chiefly for forests or for grazing.

Most of the Braddock soils in this county are on the eastern slope of Catoctin Mountain. The following profile is in a cultivated area of Braddock gravelly loam, two-tenths of a mile northwest of the intersection of Orndorff Road and Old Lime Kiln Road, about 2 miles south of Mount St. Marys College. This location is about as far from the base of Catoctin Mountain as the Braddock soils ever occur in this county.

Surface soil—

A_p 0 to 5 inches, dark-brown (10YR 3/3) gravelly loam; weak, fine, crumb structure; slightly hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many fine and medium and some larger pores; medium acid; clear wavy boundary; 4 to 6 inches thick.

Subsoil—

B_2 5 to 23 inches, strong-brown (7.5 YR 5/6) gravelly silty clay loam; strong, fine, subangular blocky structure; hard when dry, firm when moist, and plastic and sticky when wet; roots chiefly in upper part; many fine and medium pores; very strongly acid; gradual wavy boundary; 12 to 20 inches thick.

B_3 23 to 49 inches, yellowish-red (5YR 4/6) very gritty and very gravelly clay loam; moderate, coarse, blocky structure; very hard when dry, firm when moist, and plastic and sticky when wet; practically no roots; many fine and some larger pores; contains at least 50 percent decomposed metabasalt and sandstone and some hard quartzite; very

strongly acid; abrupt wavy boundary; 20 to 30 inches thick.

Substratum—

D_1 49 to 60 inches, reddish-brown Triassic gravelly and shaly clay, the remnant of an old soil now buried by colluvial material; 6 to 12 inches thick.

D_2 60 inches +, hard, red, Triassic shale and sandstone.

In most places, especially near the mountains, the D horizons are too deeply covered to be observed, and the B_3 horizon grades into the more or less unweathered cobblestones and rock fragments of the old rock slides.

Braddock cobbly loam, 3 to 8 percent slopes (BeB).—This soil has a profile like the one described, except that the rock fragments are larger. Cultivation is somewhat difficult because of the stones. This soil is in capability unit IIe–4.

Braddock gravelly loam, 3 to 8 percent slopes, moderately eroded (BgB2).—This is the best and most extensive Braddock soil in the county. Most of it is undulating, and 61 acres have slopes of slightly less than 3 percent. Surface drainage is good. Although most of this soil has been cultivated for a long time, it is not seriously eroded. It is in capability unit IIe–4.

Braddock gravelly and cobbly loams, 8 to 15 percent slopes, moderately eroded (BhC2).—This unit consists of both gravelly and cobbly areas, which are not separated on the soil map. It is in capability unit IIIe–4.

Braddock soils, 15 to 25 percent slopes, moderately eroded (BmD2).—This unit consists of scattered areas of Braddock soils, some gravelly, some cobbly, and some stony, but all too steep for successful cultivation. These areas are in capability unit VIIs–3.

Braddock very stony loam, 3 to 15 percent slopes (BkB).—These soil areas are too stony for cultivation, but they make good pasture. There is little erosion. The capability unit is VIs–2.

Brandywine Series

The Brandywine series consists of shallow, excessively drained, very immature soils. They are developing on material weathered from coarse-grained gneiss that contains coarse quartzite gravel. These soils occupy rather high dikes or ridges on the Piedmont Plateau, mostly near Chestnut Grove. They are infertile, shallow, and droughty, and they are neither extensive nor important. Most of the acreage remains in forest that is dominated by oaks but includes many dogwood trees. Some areas are used for general farming and pasture.

The following profile of a cultivated area of Brandywine gravelly loam was observed on Liberty Road six-tenths of a mile west of the intersection of Liberty Road and Chestnut Grove Road.

Surface soil—

A_p 0 to 6 inches, very dark gray (10YR 3/1) gravelly loam; strong, fine, crumb structure; soft when dry, very friable when moist, and slightly plastic but nonsticky when wet; roots plentiful; many fine and medium and a few larger pores; neutral; abrupt smooth boundary; 5 to 8 inches thick.

Subsoil—

BC 6 to 17 inches, yellowish-brown (10YR 5/4) gravelly very gritty sandy clay loam; weak, fine, subangular blocky structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots few; many fine and medium and some larger pores; a transitional layer, consisting of broken gneissic parent material infiltrated by some fine soil material; strongly acid; abrupt wavy to irregular boundary; 9 to 14 inches thick.

Substratum—

C_1 17 to 30 inches, streaked brown and light-gray (10YR 5/3 and 2.5Y 6/2) loamy coarse sand to very fine gravel; very hard when dry and in place, as if partly cemented, but quite friable when moist; no roots; rapidly permeable; very strongly acid; gradual irregular boundary; 10 to 18 inches thick.

C_2 30 to 90 inches, dark-gray (N 4/0) disintegrated gneiss of very coarse sand to fine gravel texture; contains specks of dark minerals and many small fragments of white quartzite.

D_r 90 inches +, hard coarse-grained gneiss.

In some spots there is a thin clayey layer between the A_p horizon and the BC horizon. In other areas the profile is even shallower than the one described. All of the coarser and much of the fine gravel consists of fragments of veinlike intrusions of quartzite, which are quite common in the gneiss.

Brandywine gravelly loam, 0 to 15 percent slopes, moderately eroded (BnB2).—Included are 22 acres that are rather severely eroded and which should be used for pasture or woodlots rather than for crops. This soil is in capability unit IIIe–40.

Brandywine gravelly loam, 15 to 25 percent slopes, moderately eroded (BnD2).—This soil is not severely eroded, but it is so steep and so erodible that it should be cultivated only occasionally. It is better suited to pasture than to crops. This soil is in capability unit IVe–10.

Brandywine gravelly loam, 15 to 55 percent slopes, severely eroded (BnE3).—This unit consists of severely eroded soils on slopes of more than 15 percent, and it includes less severely eroded soils on slopes of more than 25 percent. The soil is steep, thin, and droughty, and it has many gullies. It is of little value, even for pasture. All cleared areas should be reforested. This soil is in capability unit VIIe–3.

Bucks Series

The Bucks series consists of deep, well-drained, well-developed soils of the red shale uplands. They developed from materials weathered in place from dark-red Triassic shale and sandstone.

These soils have moderately high fertility and rather high moisture-supplying capacity. They are fairly easy to handle and are fairly productive under good management. They are important in only a few places because of their very limited extent.

The following profile of Bucks silt loam was examined in a cultivated area along Old Frederick Road, one-eighth of a mile northeast of Jimtown Road, just north of Creagerstown.

Surface soil—

A_p 0 to 6 inches, reddish-brown (5YR 4/3) silt loam; moderate, medium, granular structure; slightly hard when dry, friable when moist, and plastic and sticky when wet; roots abundant; many fine and some medium pores; neutral (probably limed); clear smooth boundary; 6 to 8 inches thick.

Subsoil—

B_{21} 6 to 18 inches, reddish-brown (5YR 5/4) silty clay loam; moderate, fine to medium, subangular blocky structure; hard when dry; moderately firm when moist, and plastic and sticky when wet; roots plentiful; many fine but few larger pores; slightly acid; gradual wavy boundary; 10 to 16 inches thick.

B_{22} 18 to 38 inches, dark-red (2.5YR 3/6) silty clay loam; very strong, fine to medium, subangular blocky structure; very hard when dry, firm when moist, and sticky and very plastic when wet; practically no roots; many fine but few larger pores; strongly acid; gradual irregular boundary; 18 to 24 inches thick.

Substratum—

C 38 to 42 inches +, soft to fairly hard, dark-red Triassic shale and sandstone.

Internal drainage is rather slow, and runoff is rather rapid. Bucks soils are erodible, but the slopes are gentle enough so that erosion can be easily controlled.

Bucks silt loam, 0 to 3 percent slopes (BoA).—This is the best Bucks soil in this county. It is in capability unit I–4.

Bucks silt loam, 3 to 8 percent slopes, moderately eroded (BoB2).—Good management has kept this soil from becoming more seriously eroded. Most of the soil is in capability unit IIe–4, but 6 acres that have slopes of slightly more than 8 percent need more careful management than the rest.

Captina Series

The Captina series consists of well-developed, moderately deep soils that have somewhat impeded drainage. They occur on old alluvial terraces that were once flood plains but are now well above the present flood plains. They developed from old alluvium that washed from limestone soils.

These soils are neither extensive nor important in Frederick County. They occur mostly on high terraces of the Potomac River along the Baltimore and Ohio Railroad southeast of Tuscarora. Scattered small areas are on terraces above the Monocacy River. A few very small areas of the wetter Robertsville soils are included. They are shown on the soil map as wet spots. Robertsville soils are not mapped separately in this county.

The following profile of Captina silt loam is on Chick Road 1 mile southeast of Licksville. The trees are mostly oaks and hickories, but there are some dogwoods.

Surface soil—

A_1 0 to 1 inch, black (N 2/0) loam; strong, very fine, granular structure; loose to soft when dry, loose to very friable when moist, and nonplastic and nonsticky when wet; roots abundant; many pores of all sizes; contains what appear to be very fine cinders or coal dust and is, therefore, not typical; slightly acid; abrupt wavy boundary; 1 to 3 inches thick.

A_2 1 to 9 inches, brown (10YR 5/3) light silt loam; moderate, very fine, crumb structure; moderately hard when dry, very friable when moist, and plastic and slightly sticky when wet; roots plentiful; many fine and medium and some larger pores; very strongly acid; clear wavy boundary; 6 to 10 inches thick.

Subsoil—

B_{21} 9 to 18 inches, yellowish-brown (10YR 5/4) silt loam; strong, medium, subangular blocky structure; moderately hard to hard when dry, friable when moist, and plastic and slightly sticky when wet; roots few; many fine and medium pores; extremely acid; gradual wavy boundary; 9 to 16 inches thick.

B_{22m} 18 to 34 inches, yellowish-brown (10YR 5/4) silty clay loam that has common, medium, distinct mottles and streaks of light gray; compound strong, thick, platy structure and very strong, medium, subangular blocky structure; very hard when dry, firm and brittle when moist, and plastic and sticky when wet; very few roots; many fine and medium pores, mostly oriented horizontally; extremely acid; clear irregular boundary; 15 to 30 inches thick.

B_{3m} 34 to 54 inches, strong-brown (7.5YR 5/6) variable silty clay to sandy clay; strongly mottled and having clayskins of light brownish gray (10YR 6/2); compound strong, very thick, platy structure and strong, coarse, irregular blocky structure; very hard when dry, firm and brittle when moist, and plastic and sticky when wet; no roots; common small pores but few larger pores; contains occasional waterworn chert pebbles; very strongly acid; clear wavy boundary; 12 to 20 inches thick.

Substratum—

CD 54 inches +, mottled gray and brown cobbly sandy clay.

The Captina soils have rather low fertility. They are wet at times because of impeded drainage and are not highly productive at best.

Captina silt loam, 0 to 8 percent slopes, moderately eroded (CaB2).—This is the only Captina soil in Frederick County. Most of it is moderately eroded. Spots of wet soils occur in the depressions. This soil is used mostly for grazing. It is in capability unit IIe–14.

Cardiff Series

The Cardiff series consists of shallow to moderately deep, weakly developed soils on the uplands. They formed from material weathered from quartzitic slates, and they contain many yellowish or light-brown flat fragments of slate. These soils are somewhat excessively drained. They are rather low in fertility and not highly productive.

Cardiff soils are fairly extensive in Frederick County. They occur on rather abrupt, low ridges along the eastern side of the Frederick Valley. These ridges lie between the valley and the rolling uplands of the Piedmont Plateau. They extend south-southwestward from a point just south of New Midway, in the northeastern part of the county, to the Potomac River.

The following is a profile of Cardiff channery loam on Baker Valley Road about 0.6 mile north of Fingerboard Road. The vegetation is a forest that is almost entirely oaks and maples.

Surface soil—

A_1 0 to 3 inches, very dark gray (10YR 3/1) very channery loam; strong, very fine, granular structure; soft when dry, very friable to loose when moist, and very slightly plastic but nonsticky when wet; roots plentiful; many pores of all sizes; contains about 25 percent quartzite fragments; strongly acid; clear wavy boundary; 1 to 4 inches thick.

A_2 3 to 7 inches, olive-gray (5Y 5/2) channery loam or channery silt loam; strong, fine, granular struc-

ture; soft to slightly hard when dry, loose to very friable when moist, and slightly plastic but nonsticky when wet; roots plentiful; many pores of all sizes; 10 to 20 percent of layer is fragments of quartzite; strongly acid; clear wavy boundary; 3 to 6 inches thick.

Subsoil—

BC 7 to 21 inches, light olive-brown (2.5Y 5/4) channery silty clay loam; strong, fine, subangular blocky structure; slightly hard when dry, friable when moist, and slightly plastic but nonsticky when wet; few roots; pores of all sizes; this is a transitional layer consisting of about one-fourth fine soil material, one-fourth partly decomposed slate, and one-half hard slate fragments; very strongly acid; gradual irregular boundary; 12 to 18 inches thick.

Substratum—

CD 21 to 48 inches +, a mass of light-brown to yellow slaty chips and fragments in all stages of decomposition, some soft but most very hard, and some fine material from the subsoil; mass is loose and friable; a few large tree roots; rapidly permeable; very strongly acid.

The olive colors of the Cardiff soils are inherited from the parent rock and are not due to soil-forming processes. The number of rock fragments varies.

Cardiff channery loam, 0 to 8 percent slopes, moderately eroded (CbB2).—This soil is in long, narrow areas on ridgetops. Most of it is in capability unit IIe–10. Included are 47 acres so severely eroded that they need special management.

Cardiff channery loam, 8 to 15 percent slopes, moderately eroded (CbC2).—None of this soil is severely eroded, but, because of the strong slopes and the erosion hazard, the soil is in capability unit IIIe–10.

Cardiff channery loam, 8 to 15 percent slopes, severely eroded (CbC3).—This soil is so severely eroded that it should be cultivated only very infrequently and then with great care. It is in capability unit IVe–10. Included are 43 acres that are so very seriously eroded that they should be reserved for woodlots.

Cardiff channery loam, 15 to 25 percent slopes, moderately eroded (CbD2).—There is very great danger of erosion on these strong slopes. This soil should be cultivated infrequently, if at all. Pasture is generally a more suitable use for it than crops. It is in capability unit IVe–10.

Cardiff channery loam, 15 to 25 percent slopes, severely eroded (CbD3).—This soil is so severely eroded that it can no longer be cultivated safely. It is in capability unit VIe–3.

Cardiff channery loam, 15 to 55 percent slopes, very severely eroded (CbE4).—None of this soil is suitable for cultivation or even for grazing. It should be kept in woods or reforested. It is in capability unit VIIe–3.

Cardiff channery loam, 25 to 45 percent slopes, moderately eroded (CbE2).—Even though erosion has not been severe, there is too much danger of erosion on these steep slopes for this soil to be cultivated safely. It is in capability unit VIe–3.

Cardiff channery loam, 45 to 55 percent slopes, moderately eroded (CbF2).—This soil is not severely eroded, mostly because it is still in forest. It should remain forested. It is in capability unit VIIe–3.

Catoctin Series

The Catoctin series consists of shallow, weakly developed soils. The parent materials weathered from a kind of rock locally called greenstone or Catoctin schist. This rock appears to be harder and more resistant to weathering than that from which the associated Myersville and Fauquier soils have developed.

These soils are fertile; but they are thin, they are seriously eroded in many places, and they tend to be droughty. They are well drained to somewhat excessively drained.

Catoctin soils occupy ridges of resistant rock within valleys. In Frederick County they occur chiefly in the Middletown Valley, in association with the Myersville and Fauquier soils. Most of the acreage is cultivated. Hay, principally alfalfa, is the most important crop. Some areas are in pasture, and some of the steepest slopes are still in forests of hardwoods, chiefly oaks.

The following profile of Catoctin channery silt loam is in a cultivated area along Harmony Road, three-tenths of a mile east of the Myersville-Middletown Road.

Surface soil—

A_p 0 to 8 inches, dark-brown (7.5YR 4/4) channery silt loam; weak, fine, crumb structure; slightly hard when dry, very friable when moist, and plastic and slightly sticky when wet; roots abundant; many pores of all sizes; medium acid; abrupt wavy boundary; 4 to 8 inches thick.

Subsoil—

BC 8 to 14 inches, yellowish-brown (10YR 5/4) channery heavy silt loam; moderate, coarse, crumb structure to moderate, fine, subangular blocky structure; hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and medium pores; contains many fragments of soft to hard green schist and a few of quartzite; strongly acid; clear irregular boundary; 2 to 10 inches thick.

C_{11} 14 to 26 inches, brown (7.5YR 5/4) channery silty clay loam; strong, medium, platy structure; hard when dry, firm when moist, and plastic and sticky when wet; few roots; many fine and medium pores; a transitional layer; contains 50 to 70 percent moderately soft, decomposed schist and some hard schist and quartzite fragments; strongly acid; gradual irregular boundary; 0 to 15 inches thick.

Substratum—

C_{12} 26 to 36 inches, yellowish-brown (10YR 5/4) moderately soft, decomposed schist; very hard when dry, and firm when moist or wet; slightly acid; gradual irregular to broken boundary; 0 to 30 inches thick.

C_2 36 to 60 inches, dark-brown (10YR 4/3) partly decomposed schist, strongly streaked with various shades of gray; abrupt irregular to broken boundary; 0 to 40 inches thick.

D_r 60 inches +, hard, green, schistose metabasalt.

The platy structure of the BC horizon is inherited from the schist parent material. Variations in slope and erosion cause the Catoctin soils to vary widely in characteristics over short distances. Any of the horizons may be very thin or absent. In some places there is no true subsoil; the surface soil rests directly on soft or hard rock. The soil is deeper and more uniform on the smoother, more nearly level ridgetops.

Catoctin channery silt loam, 0 to 10 percent slopes,

moderately eroded (CcB2).—This is the least eroded of the Catoctin channery silt loams mapped in this county. It has not been seriously eroded, but it is in capability unit IIe–10 because it is subject to erosion.

Catoctin channery silt loam, 10 to 20 percent slopes, moderately eroded (CcC2).—This soil has a more serious erosion hazard than the more nearly level phase. It is in capability unit IIIe–10.

Catoctin channery silt loam, 10 to 20 percent slopes, severely eroded (CcC3).—This soil is so severely eroded that cultivation is very hazardous. It is in capability unit IVe–10. It includes 25 acres that are so severely eroded that they are suitable only for trees.

Catoctin channery silt loam, 20 to 35 percent slopes, moderately eroded (CcD2).—This soil is not yet severely eroded, but the erosion hazard is so great that the soil is generally unsuitable for cultivation. This soil is in capability unit VIe–3.

Catoctin channery silt loam, 20 to 35 percent slopes, severely eroded (CcD3).—Erosion on this soil has been so severe that cultivation is no longer practical. This soil can be used for pasture if carefully managed. It is in capability unit VIe–3.

Catoctin channery silt loam, 20 to 55 percent slopes, very severely eroded (CcE4).—This is the most extensive Catoctin soil in this county. It has been so severely eroded that little if any soil remains over the greenstone bedrock. It is of little agricultural use. It should not be plowed or grazed. It might produce trees if carefully planted, protected, and managed. It is in capability unit VIIe–3.

Catoctin channery silt loam, 35 to 55 percent slopes, moderately eroded (CcF2).—Nearly all of this soil has been kept in trees or pasture, and very little of it has ever been cultivated. Consequently, it is not severely eroded, in spite of the steep slopes. This soil can be used for pasture if carefully managed, but it should never be cultivated. It is in capability unit VIe–3.

Chalfont Series

The Chalfont series consists of moderately well developed, somewhat poorly drained soils that have partly developed claypans. These soils formed from light-colored, acid, Triassic shales.

The Chalfont soils are not extensive in Frederick County. They occur on resistant ridgetops in the Piedmont Plateau area, mostly near Bethel. They are surrounded by Penn soils, which occur at lower elevations. All areas are in crops or pasture. No forests remain.

The following description of Chalfont silt loam is in a pasture on Masser Road, three-fourths of a mile northeast of the intersection of Sundays Lane and Masser Road.

Surface soil—

A_p 0 to 6 inches, dark yellowish-brown (10YR 4/4) silt loam; strong, fine to medium, granular structure; slightly hard when dry, friable when moist, and sticky and slightly plastic when wet; roots abundant; many fine and medium pores; contains some small shale chips; strongly acid; clear smooth boundary.

Subsoil—

B_{21} 6 to 15 inches, dark yellowish-brown (10YR 4/4) gritty silty clay loam that contains many shale chips; moderate, fine, subangular blocky structure; hard when dry, firm when moist, and slightly plastic and slightly sticky when wet; few roots; many fine and medium pores; strongly acid; clear to abrupt smooth boundary; 8 to 12 inches thick.

B_{22g} 15 to 30 inches, yellowish-brown (10YR 5/6) gritty silty clay to clay that has about 40 percent of fine, distinct mottles of gray; strong, medium to coarse, subangular blocky structure; very hard when dry, very firm when moist, and sticky and very plastic when wet; no visible roots; slowly to very slowly permeable; medium acid; contains some shale chips; gradual irregular boundary; 12 to 20 inches thick.

Substratum—

CD, 30 to 42 inches +, gray and olive hard shale that contains some infiltration of silt and clay; fine material light yellowish brown (2.5Y 6/4); strongly acid.

The number of shale chips in the different horizons varies considerably. Runoff is rather rapid, partly because of impeded internal drainage. Though these soils are sometimes wet, at other times they are somewhat droughty, because their moisture-supplying capacity tends to be low. The fertility is low, but, under good management, the productivity is moderate.

Chalfont silt loam, 0 to 3 percent slopes (CdA).—This soil shows practically no signs of erosion. It is in capability unit IIIw–11 because of impeded drainage.

Chalfont silt loam, 3 to 15 percent slopes (CdB).—This soil is undulating to rather strongly rolling. All of it has been moderately eroded as a result of accelerated runoff. Internal drainage is a problem, but erosion is a greater hazard. This soil is in capability unit IIIe–13.

Chandler Series

This series consists of shallow, immature, somewhat excessively drained, yellow soils of the mountains and the intermountain uplands. These soils have developed from highly micaceous materials weathered from rather hard talcose schist and mica-schist that, in many places, contain intrusions of hard, white quartzite or quartzose schist or both. The mica and talc make the soils feel greasy, especially in the subsoil.

Chandler soils are extensive in Frederick County. They occur mostly on the eastern slopes of Catoctin Mountain, between Yellow Springs and the Potomac River. Just north of Point of Rocks is a small area of dark-gray to almost black soil. It probably belongs to the Watt or the Ranger series but is not large enough or important enough to map separately.

The Chandler soils are low in fertility and are not very productive. They are droughty and erodible.

The following profile of Chandler silt loam is in a forest just south of Schoolhouse Road, one-half mile northwest of the Point of Rocks Road, about 1¼ miles north of the town of Point of Rocks.

Surface soil—

A_1 0 to 2 inches, very dark gray (10YR 3/1) silt loam; weak, medium, granular structure; slightly hard when dry, very friable when moist, and slightly plastic but nonsticky when wet; roots abundant;

many pores of all sizes; a few mica flakes; slightly acid; abrupt irregular boundary; 1 to 2 inches thick.

A_2 2 to 5 inches, dark-brown (10YR 4/3) silt loam; weak, fine, crumb structure; slightly hard when dry, very friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and medium and a few larger pores; mica flakes common; medium acid; abrupt irregular boundary; 1 to 4 inches thick.

Subsoil—

BC 5 to 9 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots rather plentiful; many fine and some medium pores; mica flakes common but not abundant; very strongly acid; gradual irregular boundary; 3 to 5 inches thick.

Substratum—

C_1 9 to 20 inches, reddish-yellow (7.5YR 6/6) silt loam to silty clay loam; moderate, medium, subangular blocky structure; hard when dry, firm when moist, and very plastic and very sticky when wet; roots very few; numerous fine but few larger pores; this is a transitional layer between subsoil and parent material; contains many fragments of partly decomposed micaceous quartz schist and abundant mica flakes; very strongly acid; diffuse irregular boundary; 10 to 22 inches thick.

C_2 20 to 38 inches, strong-brown (7.5YR 5/6) silty clay loam that consists of decomposed mica-schist; interiors of fragments finely mottled with yellow, red, reddish-brown, and gray; hard when dry, friable when moist, and plastic and sticky when wet; no roots; extremely acid; clear to abrupt broken boundary; 10 to 24 inches thick.

D_r 38 inches +, undecomposed micaceous quartz schist.

The combined thickness of the surface soil and subsoil is normally 12 to 15 inches, but it may be as little as 8 inches or more than 20 inches. Where part of the soil has been lost through erosion, the surface soil is less thick.

In Frederick County, Chandler soils have been mapped only in complexes and undifferentiated units with other soils. Soils of the Chandler series and the Talladega series are so much alike in every characteristic except color, and they merge so imperceptibly into one another that it seemed most practical to map them together in undifferentiated units.

Chandler soils are also mapped in complexes with Edgemont soils in this county. These mapping units are discussed under the Edgemont series.

Chandler and Talladega channery loams, 0 to 10 percent slopes, moderately eroded (CeB2).—The profile of the Chandler soil in this unit is about the same as the profile described, except that the surface layer is 20 percent or more flat fragments of micaceous schist similar to that from which the soil developed. The soil material in the surface layer is loam or very light silt loam.

The Talladega channery loam is similar to the Talladega very stony loam described under the Talladega series, except that the rock fragments are much smaller and do not interfere so much with cultivation. The soil material is loam or very light silt loam. These soils are in capability unit IIe–25.

Chandler and Talladega channery loams, 10 to 20 percent slopes, moderately eroded (CeC2).—The soils in this unit are not severely eroded, but because of the slopes there is a serious hazard of further erosion. These soils are in capability unit IIIe–25.

Chandler and Talladega channery loams, 20 to 35 percent slopes, moderately eroded (CeD2).—In this unit, erosion has not been serious so far, but the hazard of further erosion is serious. These soils are in capability unit VIe–3.

Chandler and Talladega channery loams, 20 to 35 percent slopes, severely eroded (CeD3).—These soils are no longer suitable for cultivated crops, but they might safely be grazed under very careful management. They are in capability unit VIe–3. Included are 36 very severely eroded acres that should not be used even for hay or pasture; they should be kept in trees.

Chandler and Talladega channery loams, 35 to 45 percent slopes, moderately eroded (CeE2).—All of this unit should be forested; it is too steep and has too serious an erosion hazard to be used safely for anything else. A little of it is severely eroded, but this makes little difference in the management. This unit is in capability unit VIIe–3.

Chandler and Talladega silt loams, 0 to 10 percent slopes, moderately eroded (CgB2).—The Chandler silt loam in this unit has a profile like that described for the series. The Talladega silt loam has a profile similar to that described under the Talladega series, but it has a silt loam surface soil and it does not contain the quantities of stones that the very stony loam does. These soils are in capability unit IIe–25. Included are 16 acres that are somewhat severely eroded and should be managed accordingly.

Chandler and Talladega silt loams, 10 to 20 percent slopes, moderately eroded (CgC2).—Because of its slopes, this unit is in capability unit IIIe–25. It should have careful management. Included are 29 acres that are so severely eroded that they should be treated as if they were in capability unit VIe–3.

Chandler and Talladega silt loams, 20 to 35 percent slopes, moderately eroded (CgD2).—These soils are generally unsuited for cultivation because of the steep slopes and the erosion hazard. An occasional crop of hay could be grown, but pasture is a safer and more suitable use. These soils are in capability unit VIe–3.

Chandler and Talladega silt loams, 20 to 35 percent slopes, severely eroded (CgD3).—These soils should not be cultivated. They can be grazed if very carefully managed. They are in capability unit VIe–3.

Chandler and Talladega very stony loams, 0 to 20 percent slopes, moderately eroded (ChC2).—These soils are too stony for cultivation. They contain large stones, some boulders, and outcrops of quartzite or quartz schist. They can be grazed if carefully managed. Both soils are in capability unit VIs–2.

Chandler and Talladega very stony loams, 20 to 45 percent slopes, moderately eroded (ChD2).—The soils in this unit are not suitable for crops or pasture. They should be reforested if not now in forest. They are in capability unit VIIs–3.

Chester Series

The Chester series consists of deep, well-drained soils developed on materials weathered from micaceous

schist that contains some white quartzite. The Chester soils are deeper and more strongly developed than the Glenelg soils, with which they are closely associated. On the other hand, they are not quite so strongly developed as the Elioak soils, which developed from similar materials.

The Chester soils in Frederick County are not extensive. They are located in the rolling uplands of the Piedmont Plateau in the eastern and southern parts of the county. They are very good agricultural soils, suited to a wide range of crops. Nearly all of the acreage is in cultivation. Only a few small areas remain in hardwood forest.

The following profile of Chester loam is in a forest on Green Valley Road, five-eighths of a mile west of the intersection of Ridge Road and Green Valley Road.

Surface soil—

A_1 0 to 2 inches, very dark grayish-brown (10YR 3/2) loam that contains some fine gravel; weak, medium, crumb structure; moderately hard when dry, very friable when moist, and sticky and slightly plastic when wet; roots abundant; many fine and medium and some larger pores; neutral; clear wavy boundary; 2 to 3 inches thick.

A_3 2 to 10 inches, dark-brown (7.5YR 4/4) loam that contains some fine gravel; weak, fine, crumb structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and medium pores; medium acid; abrupt wavy boundary; 7 to 12 inches thick.

Subsoil—

B_2 10 to 28 inches, yellowish-red (5YR 5/8) clay loam; compound moderate, coarse, subangular blocky structure and strong, fine, granular to crumb structure; hard to very hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful in upper part, fewer below; many fine and medium pores; thin, almost continuous clayskins; very strongly acid; gradual wavy boundary; 16 to 30 inches thick.

B_3 28 to 40 inches, yellowish-red (5YR 4/8) micaceous clay loam; strong, medium to coarse, subangular blocky structure; very hard when dry, firm when moist, and very plastic and very sticky when wet; somewhat compact; roots very few; many fine and some medium pores; discontinuous clayskins; contains considerable decomposed schist; very strongly acid; gradual wavy boundary; 12 to 20 inches thick.

Substratum—

C_1 40 to 56 inches, yellowish-red (5YR 4/6) soft schist containing some gneiss gravel and much micaceous clay; irregular blocky structure; hard when dry, firm when moist, and sticky and very plastic when wet; no roots; strongly acid; gradual wavy boundary; 12 to 24 inches thick.

C_2 56 inches +, reddish, soft mica schist containing some gneiss and quartz schist gravel; strongly mottled with gray and yellow; massive; slightly to moderately hard when dry, friable when moist, and plastic and sticky when wet.

The Chester soils in Frederick County are quite uniform. In some places the gravel is mostly quartzite, in others it is gneiss or schist. In no place is the soil more than about 10 percent gravel, and in most places it is less.

Chester loam, 0 to 3 percent slopes, moderately eroded (CkA2).—This is a good soil, but only a few acres are mapped in the county. It is in capability unit I–4.

Chester loam, 3 to 8 percent slopes, moderately eroded (CkB2).—Most of the Chester soil in the county is in this unit. Practically all of it is cultivated. Because of the slope and moderate erosion hazard, this soil is in capability unit IIe–4.

Chester loam, 8 to 15 percent slopes, moderately eroded (CkC2).—Because of the slope and the erosion hazard, this soil is in capability unit IIIe–4. Included are 11 acres of somewhat steeper slopes.

Chewacla Series

The Chewacla soils consist of recently deposited fine materials washed from soils derived from acidic crystalline rocks, mainly schist. These soils are rather low in fertility. They are moderately well drained but are likely to remain wet after thaws or after long rainy spells. They are occasionally flooded.

These are the most extensive flood-plain soils mapped in Frederick County. They occur within and downstream from areas of Manor, Linganore, Glenelg, Myersville, and Fauquier soils.

In general, the Chewacla soils are not suitable for crops. They are used mainly for unimproved or partly improved pasture. Many areas are in rather wet woodlands.

The following profile of Chewacla silt loam was observed under forest on the flood plain of Bens Branch, just off Jesse Smith Road, 1¼ miles northeast of United States Highway No. 40.

Surface soil—

A_1 0 to 10 inches, dark olive-brown (2.5Y 4/2) silt loam; weak, fine, crumb structure; slightly hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many fine and medium and some larger pores; contains some mica flakes; strongly acid; clear smooth to wavy boundary; 7 to 12 inches thick.

Subsoil—

B_{1g} 10 to 32 inches, light olive-brown (2.5Y 5/4) silt loam faintly mottled with medium gray and light gray; weak to moderate, medium, crumb structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful in upper part, very few in lower part; many fine and medium and a few larger pores; contains considerable mica; very strongly acid; abrupt wavy boundary.

B_{2g} 32 to 48 inches +, pale-olive (5Y 6/4) gravelly loam that has common, medium, distinct mottles of strong brown, yellow, and gray; weak, medium, platy structure; hard when dry, firm when moist, and plastic and sticky when wet; no roots; rather slowly permeable; contains much mica; extremely acid; has abrupt boundary at undetermined depth over a stratified gravel substratum (D).

The olive colors and the mottling in the subsoil are caused by chemical reduction of part of the iron minerals in the silt and clay. The reduction takes place because the soil is poorly aerated. In a few places the soil is more reddish brown than that described. In other places, the surface soil is thicker, and the mottling does not appear above a depth of 20 inches.

Chewacla silt loam, 0 to 3 percent slopes (CmA).—This is the only Chewacla soil in Frederick County. It should seldom be used for crops, because it has rather low fertility and is wet part of the year. If artificially drained, it is suitable for pasture. It is in capability unit Vw–1. Included are 87 acres that have slopes of slightly more than 3 percent. Two acres of this are

badly gullied, but the gullies make little difference in use and management.

Clymer Series

The Clymer series consists of deep, well-drained soils developed from materials weathered from light-colored or quartzitic sandstones. In Frederick County, Clymer soils occur on the crests and upper slopes of mountains. Most of the acreage is on Catoctin Mountain. Associated soils are those of the Dekalb, Edgemont, and Chandler series.

The Clymer soils are usually low in fertility. Most of the acreage in this county is in forest dominated by oak, but there is also considerable yellow-poplar, hickory, sweet birch, and locust. The ground cover consists of rhododendron, some huckleberry, and many ferns.

The following profile of Clymer very stony loam is on Catoctin Mountain, 4¼ miles north of the Fishing Creek Reservoir, near the headwaters of Little Fishing Creek.

Surface soil—

A_1 0 to 2 inches, dark-gray (10YR 4/1) very stony light loam; very weak, medium, crumb structure; soft when dry, loose to very friable when moist, and nonplastic and nonsticky when wet; roots abundant; many pores of all sizes; very strongly acid; clear smooth to wavy boundary; 1 to 3 inches thick.

A_2 2 to 8 inches, light yellowish-brown (10YR 6/4) light loam; moderate, medium, granular structure; soft to slightly hard when dry, very friable when moist, and nonplastic and nonsticky when wet; roots plentiful; many pores of all sizes; very strongly acid; gradual smooth to wavy boundary; 3 to 8 inches thick.

Subsoil—

B_1 8 to 14 inches, yellowish-brown (10YR 5/6) gritty stony loam; moderate, fine to medium, granular structure; soft to slightly hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots few; many fine and medium pores; strongly acid; gradual wavy boundary; 4 to 10 inches thick.

B_{21} 14 to 28 inches, strong-brown (7.5YR 5/6) stony heavy loam to sandy clay loam; moderate, medium, subangular blocky structure; hard when dry, friable to rather firm when moist, and sticky and slightly plastic when wet; many fine and some medium pores; very strongly acid; gradual wavy boundary; 10 to 24 inches thick.

B_{22} 28 to 42 inches, yellowish-red (5YR 5/6) stony sandy clay loam; strong, medium, subangular blocky structure; hard to very hard when dry, firm when moist, and plastic and sticky when wet; roots very few; moderately slowly permeable; very strongly acid; clear wavy boundary; 9 to 15 inches thick.

BC 42 to 60 inches, strong-brown (7.5YR 5/8) sandy loam to sandy clay with common, distinct mottles of red and reddish yellow; weak, coarse, blocky structure; variable consistence; no roots; many fine and medium pores; transitional between subsoil and parent material; medium acid; abrupt irregular boundary; 12 to 24 inches thick.

Substratum—

D_r 60 inches +, coarse-grained, light-gray quartzitic sandstone.

The Clymer soils range in depth from about 27 to 60 inches. In the more stony areas, fairly large boulders are common, both in the soil and on the surface.

Clymer very stony loam, 0 to 20 percent slopes (CnB).—A few spots of this soil are comparatively free of stones, but they are not mapped separately. This soil is not particularly steep and is not seriously eroded. It would make good grazing land, so it is placed in capability unit VIs–2. However, almost all of it is in State or Federal parks or forests, and it will probably never be used for agriculture.

Colbert Series

The Colbert series consists of somewhat poorly drained upland soils with a weakly developed claypan. Their parent material was very old clay or sandy clay, which was probably derived from limestone. All free lime has been removed by weathering and leaching. The Colbert soils are thin. They have heavy very slowly permeable subsoils. Aeration is poor.

The Colbert soils are of limited extent and importance in Frederick County. The only unit mapped here is a deep variant of the series. It occurs on nearly level uplands within the limestone valley sections of the county, where it is associated with soils of the Duffield, Guthrie, and Athol series. The following profile of Colbert silt loam, deep variant, is in an idle area on Putman Road, one-fourth mile west of Emmitsburg Road and about 1 mile northwest of Lewistown.

Surface soil—

A_p 0 to 8 inches, olive (5Y 5/3) rather gritty silt loam that has very faint mottles of light gray and a few black specks, apparently of organic matter; weak, fine, granular structure; slightly hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and medium pores; mildly alkaline (limed); clear smooth boundary; 4 to 8 inches thick.

Subsoil—

B_2 8 to 16 inches, olive-yellow (2.5Y 6/6 gritty silty clay that has faint mottles of olive brown and light brownish gray (2.5Y 4/4 and 2.5Y 6/2); moderate, medium, subangular blocky structure; very compact and dense; very hard when dry, firm when moist, and plastic and sticky when wet; roots few; many fine but very few larger pores; neutral; gradual wavy boundary; 4 to 8 inches thick.

Substratum—

C_g 16 to 36 inches +, evenly mottled pale-yellow and yellowish-brown (2.5Y 7/4 and 10YR 5/6) gritty sandy clay; weak, coarse, blocky structure in upper part, structureless in lower part; hard when dry, very firm when moist, and plastic and sticky when wet; no roots; only a few small pores; very strongly acid; may extend to depth of several feet.

Mottling begins at about 12 inches depth in a typical Colbert soil, but it begins at 8 inches in this profile because the soil has somewhat slower drainage. Because of the impeded drainage, the soils are either very wet or very droughty, according to season. In some places, fine materials washed from nearby higher areas have accumulated on the surface.

These soils are difficult to manage and not highly productive. Fertility is rather low. Some fairly good crops may be grown under very good management.

Colbert silt loam, deep variant, 0 to 3 percent slopes (CoA).—This soil differs from most of the soils in the Colbert series. It is more than 36 inches deep over bedrock, while the typical Colbert soils are less than 36

inches deep. The C horizon is sandy clay instead of the clay or silty clay in a typical C horizon of the series. This deep variant has a weak B horizon, but most Colbert soils have none.

Most of this unit is in capability unit IIw–2. Included are 33 acres on slopes of more than 3 percent, where erosion may become serious if the soil is not well managed.

Conestoga Series

The Conestoga series consists of deep, well-drained, moderately well developed soils derived from a mixture of metamorphosed rocks, mostly limestone schist, mica-schist, and marble. These soils are fertile and have moderately high moisture-supplying capacity. Under good management, they are highly productive. However, they need special care to prevent soil loss, because they erode easily.

Conestoga soils occur in the eastern part of Frederick County, on uplands in the Piedmont Plateau. The largest areas are around Clemsonville and between Oldfield and Oak Orchard. Most of the acreage is used for crops or for high-grade pasture. A few small areas are still in forest.

The following profile of Conestoga silt loam was observed in a small area of second-growth forest, previously cultivated, on Pearre Road, three-fourths of a mile south of McKinstrys Mill Road.

Surface soil—

A_p 0 to 7 inches, dark-brown (10YR 4/3) silt loam; strong, coarse, crumb structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots abundant; many fine and medium pores and some worm channels; mildly alkaline (limed); clear smooth boundary; 6 to 8 inches thick.

Subsoil—

B_1 7 to 14 inches, dark-brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and medium pores and some worm channels; mildly alkaline; gradual wavy boundary; 5 to 9 inches thick.

B_{21} 14 to 28 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; very hard when dry, moderately firm when moist, and plastic and sticky when wet; fairly few roots; many fine and some larger pores; neutral; gradual wavy boundary; 12 to 20 inches thick.

B_{22} 28 to 50 inches, yellowish-brown (10YR 5/4) silty clay loam; strong, fine to medium, subangular blocky structure; hard when dry, firm when moist, and plastic and sticky when wet; very few roots; many fine but few larger pores; contains many chips of schist or fragments of partly weathered marble; thin continuous clayskins; neutral to mildly alkaline; clear irregular boundary; 18 to 30 inches thick.

Substratum—

C 50 to 60 inches +, yellowish-brown (10YR 5/6) silty clay; structureless; hard when dry, very firm when moist, and sticky and very plastic when wet; no roots; moderately slowly to slowly permeable; consists chiefly of decomposed schist and partly decomposed marble; mildly alkaline, some marble fragments are calcareous; grades with depth into hard brown calciferous schist and very hard white, pink, and lavender marble.

In some areas the entire profile is slightly darker colored and shallower. Fine schist gravel and fragments of marble are rather common on and in the soil in some places.

Conestoga silt loam, 0 to 8 percent slopes, moderately eroded (CpB2).—This is the most extensive Conestoga soil in the county. Some areas are nearly level and slightly eroded, but most are sloping and moderately eroded. This is an excellent soil for all crops of the area. It is in capability unit IIe–24.

Conestoga silt loam, 8 to 15 percent slopes, moderately eroded (CpC2).—Because of steeper slope and greater erosion hazard, this soil requires more careful management and more intensive erosion control practices than Conestoga silt loam, 0 to 8 percent slopes, moderately eroded. It is in capability unit IIIe–24.

Conestoga silt loam, 15 to 25 percent slopes, moderately eroded (CpD2).—This soil is in capability unit IVe–1 because erosion is a serious hazard. Included are 11 acres that have slopes of slightly more than 25 percent.

Congaree Series

Most of the Congaree soils are deep, well-drained soils on the flood plains. These soils consist of recently deposited fine materials washed from soils that overlie crystalline rocks. Most of the parent material was derived from the Manor, Cardiff, Glenelg, Chester, Myersville, and Fauquier soils. Other Congaree soils are on foot slopes and consist of local alluvium.

The Congaree soils are moderately fertile and are easy to manage. They can be made and kept highly productive. They are fairly wet in the spring. The flood hazard is not serious, but some spots are flooded occasionally. Nearly all of the acreage is used for crops or for high-quality pasture.

The following profile of Congaree silt loam was taken at mile 19.7 on Wolfsville Road, in a forested area on the flood plain of Catoctin Creek.

Surface soil—

1. 0 to 9 inches, dark-brown (10YR 3/3) slightly gritty silt loam; weak, fine, granular structure; moderately hard when dry, very friable when moist, and slightly plastic but nonsticky when wet; roots very abundant; many pores of all sizes; medium acid; clear smooth boundary; 6 to 10 inches thick.

Subsoil—

2. 9 to 44 inches, dark yellowish-brown (10YR 4/4) light silt loam to fine sandy loam; weak, coarse, crumb structure to very weak, fine, subangular blocky structure; moderately hard when dry, friable when moist, and plastic and slightly sticky when wet; roots plentiful in upper part, fewer in lower part; many fine and medium and some larger pores; strongly acid; gradual smooth boundary; 25 to 45 inches thick.

Substratum—

3. 44 to 60 inches +, dark yellowish-brown gravelly loam to gravelly sandy loam faintly mottled with light gray and brownish red; structureless; moderately hard when dry, friable when moist, and plastic and slightly sticky when wet; very few roots; moderately rapidly permeable; very strongly acid.

The substratum is coarser textured than the upper horizons, and it is very gravelly in some places. Some

fine gravel is common throughout the profile, but in some places there is none in the upper horizons. Lenses or varves of sand may occur anywhere in the profile, but they are not common.

Congaree silt loam, 0 to 3 percent slopes (CrA).—This soil is on the flood plains. It is in capability unit I–6. Included are 4 acres that have slopes of slightly more than 3 percent.

Congaree silt loam, local alluvium, 0 to 3 percent slopes (CsA).—This soil is on foot slopes. It is less likely to be flooded than the Congaree silt loam of the flood plains, but it is more likely to erode. However, since the erosion hazard is slight, this soil is in capability unit I-4.

Congaree silt loam, local alluvium, 3 to 8 percent slopes (CsB).—This soil is on the more strongly sloping areas at the base of upland slopes. Because of the erosion hazard, it is in capability unit IIe–4. Included are 78 acres having slopes of slightly more than 8 percent, some parts of which have been moderately eroded.

Croton Series

The Croton series consists of well-developed, poorly drained, shallow to moderately deep soils developed from materials weathered from red shale and sandstone of Triassic age. They occur in upland flats and depressions and around the heads of drains. They are associated chiefly with soils of the Penn and Readington series.

The following is a profile of Croton silt loam, overwashed, in a pastured area just north of Blacks Mill Road, seven-tenths of a mile west of its intersection with Old Frederick Road at Creagerstown.

Surface soil—

A_{1p} 0 to 6 inches, reddish-brown (5YR 4/3) silt loam; moderate, medium, crumb structure; slightly hard when dry, friable when moist, and plastic and sticky when wet; roots abundant; many fine and medium pores; this layer consists of an overwash of local alluvium; neutral (limed); diffuse smooth boundary; 5 to 8 inches thick.

A_{1e} 6 to 16 inches, reddish-brown (5YR 4/4) rather compact silt loam with a few very dark brown and black specks, apparently organic; strong, coarse, crumb structure to moderate, fine, subangular blocky structure; moderately hard when dry, moderately firm when moist, and plastic and sticky when wet; roots common; many fine but few larger pores; layer is mostly or entirely an overwash of local alluvium; neutral; clear to abrupt smooth boundary; 8 to 10 inches thick.

Subsoil—

B_{21g} 16 to 26 inches, light-gray (2.5Y 7/2) silty clay loam that has many, medium, distinct mottles of yellow and brownish yellow (10YR 8/6 and 10YR 6/6); moderate, fine, subangular blocky structure; moderately hard when dry, firm and brittle when moist, and plastic and very sticky when wet; practically no roots; a moderate number of fine pores; very strongly acid; gradual wavy boundary; 10 to 20 inches thick.

B_{22mg} 26 to 36 inches, reddish-brown (5YR 4/4) clay loam to clay that has common, fine mottles of pinkish gray and white; compound moderate, coarse, platy structure and strong, fine to medium, irregularly flattened blocky structure; very hard when dry, very firm when moist, and extremely plastic and very sticky when wet; no roots; very slowly permeable; this is a hardpan or fragipan layer; strongly acid; abrupt wavy boundary; 8 to 20 inches thick.

Substratum—

C_1 36 to 42 inches, dark reddish-brown (2.5YR 3/4) clay loam to clay that has a few scattered specks of pinkish gray and black; very weak, coarse, blocky structure, or in some places structureless; extremely hard when dry, very firm when moist, and extremely plastic and very sticky when wet; no roots; very slowly permeable; slightly acid; gradual wavy boundary; 4 to 8 inches thick.

C_2 42 inches +, dark-red sandy loam to clay loam consisting of disintegrated sandstone and shale; structureless; variable consistence; neutral reaction.

The Croton soils in Frederick County cover a wide range of characteristics. Any one area varies considerably in cross section. Near the center of each area, the profile is deeper, the drainage poorer, and the mottling more intense. Near the outer edge of the area, the soil is shallower, the drainage is somewhat better, there is less mottling, and more of the fine soil materials have accumulated on the surface.

Croton silt loam, overwashed, 0 to 8 percent slopes (CtB).—All of the Croton soil in Frederick County is in this overwashed phase. It occurs in relatively small areas throughout the red shale areas extending from the northeastern corner of the county to the flood plain of the Potomac River south of Pleasant View.

The surface of the soil has been covered by an accumulation of fine materials washed from nearby slopes. In a few spots the overwashed material is so thick that the Croton profile beneath is not quite so wet as its poor drainage would normally make it. Some small spots of very poorly drained, black-surfaced soil are inclusions of Stanton soils. The Stanton soils are not mapped separately in this county and are shown on the map only by wet spot symbols. Erosion symbols show the 39 acres of Croton soil that have been so eroded as to need special treatment. The main part of this soil is in capability unit Vw-2.

Dekalb Series

The Dekalb series consists of shallow, or skeletal, excessively drained soils. Most of the parent material weathered from quartzitic sandstone; some of it was derived from shale. These soils are droughty and extremely acid. Their fertility and productivity are very low.

Dekalb soils occur on South Mountain and Catoctin Mountain in Frederick County. Most of the acreage is stony and steep and is suitable only for forest. The forests consist mostly of oaks. There are scattered shortleaf pines and, in most places, an understory of rhododendron and huckleberry.

The following profile of Dekalb very stony loam was taken in a forest on Gambrill Park Road 1 mile north of United States Highway No. 40.

Surface soil—

A_1 0 to 1 inch, black (10YR 2/1) very stony loam; weak, fine, crumb structure; soft when dry or moist, and nonplastic and nonsticky when wet; roots fairly abundant; many pores of all sizes; very strongly acid; abrupt wavy boundary; ½ to 2 inches thick.

A_2 1 to 2 inches, grayish-brown (2.5Y 5/2) stony gritty sandy loam; moderate, fine, granular to single-grain structure; soft to slightly hard when dry, very friable when moist, and nonplastic and non-

sticky when wet; roots plentiful; many pores of all sizes; extremely acid; abrupt wavy boundary; ½ to 3 inches thick.

Subsoil—

B_2 A very thin layer, usually about 1/8 inch thick, of dark yellowish-brown loam (10YR 4/4); this horizon is too thin for sampling or for more complete description.

BC 2 to 20 inches, yellowish-brown (10YR 5/6) stony gritty loam; weak, medium, crumb structure; slightly hard when dry, friable when moist, and very slightly plastic and very slightly sticky when wet; large roots common, fine roots few; many pores of all sizes; a mixture of hard rock, decomposed rock parent material, and about 20 percent fine soil material; extremely acid; diffuse broken boundary; 4 to 24 inches thick.

Substratum—

C 20 to 60 inches, yellowish-brown (10YR 5/4) very stony coarse sandy loam or loamy coarse sand; structureless; loose when dry, and very friable when moist; a few large tree roots; very rapidly permeable; consists of hard and partly disintegrated quartzitic sandstone; very strongly acid; diffuse broken boundary; 0 to 72 inches thick.

D_r 60 inches +, hard, channery, light-colored, coarse-grained quartzitic sandstone or fine quartzite conglomerate.

The Dekalb soils vary considerably in depth to bedrock. This depth may be as little as 6 inches but is usually about 15 to 20 inches.

Dekalb loam, 0 to 10 percent slopes, moderately eroded (DaB2).—This soil has a profile like the one described, but it has only a few stones in the surface layer. Cultivation is possible, but the fertility and productivity are low. The soil is in capability unit IIe–10.

Dekalb loam, 10 to 20 percent slopes, moderately eroded (DaC2).—This soil can be cultivated, but it needs protection against erosion. It is in capability unit IIIe–10.

Dekalb very stony loam, 0 to 35 percent slopes (DbC).—This is the soil described as typical of the series. From about 30 to nearly 80 percent of the surface is covered with stones or boulders of quartzitic sandstone. This soil is in capability unit VIIs–2.

Duffield Series

The Duffield series consists of well-drained soils that developed from impure limestones. These soils occur in the broad, shallow Frederick Valley, which is drained by the Monocacy River. They are fertile, highly productive, and easy to manage. They are both extensive and important in the county. They are used for all the common crops, but principally for grain, hay, and pasture.

The Duffield soils and the Frankstown soils are very much alike in use suitability and in management needs. They are mapped together in undifferentiated units, some areas of which are entirely Duffield soil, some entirely Frankstown soil, and some partly one and partly the other. The Frankstown soils are a little shallower than the Duffield soils, and they contain more shale or cherty gravel as residual impurities from the limestone. The more eroded areas in the combined units are likely to be the Frankstown soils.

The following profile of Duffield silt loam was observed in a cultivated area along Dublin Road, 1 mile north of its intersection with Biggs Ford Road, about 2 miles northwest of Walkersville.

Surface soil—

A_p 0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam that contains a noticeable amount of fine sand; soft, fine, crumb structure; very mellow; very slightly hard when dry, very friable to almost loose when moist, and slightly plastic and slightly sticky when wet; roots abundant; many pores of all sizes; very low volume weight (bulk density); neutral (limed); clear wavy boundary; 6 to 10 inches thick.

Subsoil—

B_{21} 10 to 20 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak, fine, subangular blocky structure; hard when dry, slightly to moderately firm when moist, and plastic and sticky when wet; roots plentiful in upper part; many fine and medium and some larger pores; slightly acid; gradual wavy boundary; 8 to 12 inches thick.

B_{22} 20 to 33 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; hard to very hard when dry, firm when moist, and plastic and sticky when wet; roots few; many fine and medium pores; surfaces of many aggregates are coated with black films or clay-skins, apparently manganese; medium to strongly acid; gradual wavy to irregular boundary; 10 to 20 inches thick.

B_3 33 to 49 inches, strong-brown (7.5YR 5/6) silty clay loam containing abundant soft, decomposed, brownish-yellow shale chips; compound weak, platy structure, crushing with pressure to weak, fine, irregular subangular blocky structure; hard when dry but separates easily along structural lines, firm when moist, and plastic and sticky when wet; no roots; many fine and some medium pores; strongly acid; gradual irregular boundary; 10 to 20 inches thick.

Substratum—

C 49 to 55 inches, strong-brown (7.5YR 5/8) decomposed platy limestone and shale, strongly streaked and mottled with gray; platy structure; hard when dry, very firm when moist, and plastic and very sticky when wet; slightly acid; abrupt irregular to broken boundary; 4 to 8 inches thick.

D_r 55 inches +, hard, thin platy limestone interbedded with calcareous shale.

The platy structure of the C horizon is inherited from the platy limestone parent material.

Duffield silt loam, 0 to 3 percent slopes (DcA).—This soil has been well managed, and there has been practically no erosion. Yields of crops and pasture are very high. This soil is in capability unit I-1.

Duffield and Frankstown silt loams, 0 to 3 percent slopes (DeA).—In the mapping units of Duffield and Frankstown silt loams, the Duffield soils predominate. This unit is in capability unit IIe–1 because an erosion pattern has become established, and there has already been moderate damage. More careful erosion control practices are necessary.

Duffield and Frankstown silt loams, 3 to 8 percent slopes, moderately eroded (DeB2).—These soils are so productive that most of them have been used intensively for more than 200 years. However, they have had good management and are still excellent soils. This unit is in capability unit IIe–1. Included are about 4 acres that are more severely eroded than the rest and should be given special protection and care.

Duffield and Frankstown silt loams, 8 to 15 percent slopes, moderately eroded (DeC2).—In spite of their slope, these are excellent soils that can safely be

cultivated if carefully managed. The unit is in capability unit IIIe–1. Included are 4 acres that are more severely eroded. These areas should be kept in permanent vegetation.

Duffield and Frankstown silt loams, 15 to 25 percent slopes, moderately eroded (DeD2).—Cultivation of these soils should be only occasional or limited. Pasture would be a much safer use for them. Included are 14 acres that have been severely eroded and 4 acres that have slopes of a little more than 25 percent. These areas should be kept in permanent cover of pasture or woods. The unit as a whole is in capability unit IVe–1.

Duffield and Frankstown shaly silt loams, 0 to 3 percent slopes, moderately eroded (DdA2).—In the shaly silt loam units, Frankstown soils predominate. The shaly silt loams are, in most places, a little shallower than the silt loams. Although the slopes are gentle, erosion is active everywhere. It is not severe, however, so the unit is in capability unit IIe–1.

Duffield and Frankstown shaly silt loams, 3 to 8 percent slopes, moderately eroded (DdB2).—This is the most extensive unit of the Duffield and Frankstown shaly silt loams. It is in capability unit IIe–1.

Duffield and Frankstown shaly silt loams, 8 to 15 percent slopes, moderately eroded (DdC2).—This unit is in capability unit IIIe–1. Included are 11 acres that are more severely eroded than the rest; they should be kept in permanent cover.

Edgemont Series

The Edgemont series consists of moderately deep to deep, well-developed, well-drained soils derived from materials weathered from quartz-schist, quartzitic sandstone, quartzite conglomerate, and some fairly pure quartzite. Nearly all of the gravelly Edgemont soils in Frederick County occupy elevated areas or ridges in the Piedmont Plateau. They are associated chiefly with the Manor, Glenelg, and Chester soils. The stony and channery Edgemont soils are mostly on Catoctin Mountain and Sugarloaf Mountain and are associated chiefly with Dekalb, Chandler, Talladega, and Clymer soils.

These soils are generally low in fertility and not very productive. Most of the acreage, especially that on the mountains, is in forest that is dominated by oaks and contains some shortleaf pine, hickory, dogwood, and other trees. Many areas on the Piedmont Plateau are used for general crops and pasture.

The following is a profile of Edgemont very stony loam in a forest on Ridge Road about two-tenths of a mile north of its intersection with Green Valley Road, near the Carroll County line.

Surface soil—

A_1 0 to 3 inches, very dark brown (10YR 2/2 fine gravelly very stony loam; moderate, medium, crumb structure; slightly hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many fine and medium and some larger pores; very strongly acid; clear wavy boundary; 2 to 5 inches thick.

A_2 3 to 10 inches, brown (10YR 4/3) fine gravelly and gritty stony loam; moderate, fine, crumb structure; moderately hard when dry, friable when moist, and sticky and slightly plastic when wet; roots plentiful; many fine and medium pores; extremely acid; clear wavy boundary; 6 to 8 inches thick.

Subsoil—

B_{21} 10 to 22 inches, yellowish-brown (10YR 5/4) fine gravelly and gritty stony silt loam to stony silty clay loam; moderate to strong, medium, subangular blocky structure; moderately hard to hard when dry, firm when moist, and plastic and sticky when wet; few roots; many fine and medium pores; very strongly acid; gradual wavy boundary; 10 to 16 inches thick.

B_{22} 22 to 38 inches, light yellowish-brown (10YR 6/4) gravelly gritty silty clay loam; rather weak, medium, subangular blocky structure, crushing to strong, fine, crumb structure; hard when dry, firm when moist, and plastic and sticky when wet; very few roots; many fine and medium pores, mostly filled with clay; contains much fine mica; very strongly acid; gradual irregular boundary; 12 to 20 inches thick.

Substratum—

C 38 to 46 inches, yellowish-brown (10YR 5/6) highly micaceous silty clay loam that consists mostly of soft decomposed quartz-schist; very weak, coarse, subangular blocky and blocky structure; hard when dry, very firm when moist, and very plastic and very sticky when wet; no roots; moderately slowly permeable; very strongly acid; abrupt broken boundary; 6 to 16 inches thick.

D_r 46 inches +, bedrock of quartz-schist and quartzite.

The grit and gravel in the profile consist almost entirely of quartzite. Some profiles are more strongly and deeply weathered than the one described. In such areas the B_{21} and B_{22} horizons are somewhat more distinctly yellow, and the A_2 horizon is almost gray.

Edgemont gravelly loam, 0 to 8 percent slopes, moderately eroded (EaB2).—This soil has a profile like that described, except that it has few or no stones in the surface soil. It is in capability unit IIe–25.

Edgemont gravelly loam, 8 to 15 percent slopes, moderately eroded (EaC2).—This soil has a more serious erosion hazard than Edgemont gravelly loam, 0 to 8 percent slopes, moderately eroded, because it has steeper slopes. It is in capability unit IIIe–25.

Edgemont gravelly loam, 15 to 25 percent slopes, moderately eroded (EaD2).—The slopes are so strong that this soil can safely be cultivated only infrequently or to a very limited extent. Pasture would be the best use for it. It is in capability unit IVe–25.

Edgemont gravelly loam, 25 to 45 percent slopes (EaE).—These slopes are so steep that cultivation is generally impractical. If carefully managed, however, this soil can be grazed. It is in capability unit VIe–3.

Edgemont very stony loam, 0 to 20 percent slopes (EbC).—This soil has a profile like that described in detail for the series. It is much too stony for cultivation, but it can be grazed. It is in capability unit VIs–2.

Edgemont very stony loam, 20 to 60 percent slopes (EbE).—These areas are so steep and so stony that they are suitable neither for crops nor for pasture. They are in capability unit VIIs–3.

Edgemont-Chandler channery loams, 0 to 10 percent slopes, moderately eroded (EcB2).—This unit is a mixture of Edgemont, Dekalb, and Chandler soils. In many places two or three of these soils are so intricately mixed that they cannot be separated on the soil map. In other places, the soil has some characteristics of two or more series and is an intergrade between them. In

other places it was not practical to separate the soils because their use and management would have been essentially the same whether they were separated or not.

These areas were mapped as complexes of two or three soils. They were given the name Edgemont-Chandler because these two series are dominant, and the Dekalb soils are only a minor part of the complex.

These soils are not very fertile or productive, but they can be cultivated safely. They are in capability unit IIe–10.

Edgemont-Chandler channery loams, 10 to 20 percent slopes, moderately eroded (EcC2).—These soils can be cultivated if proper care is taken. They are in capability unit IIIe–10.

Edgemont-Chandler channery loams, 10 to 20 percent slopes, severely eroded (EcC3).—Because of the severe erosion, these soils need very careful management if cultivated or used for pasture. They are in capability unit IVe–10. Included are 13 acres so severely eroded that they should not be cultivated or grazed. These areas should be reforested.

Edgemont-Chandler channery loams, 20 to 35 percent slopes, moderately eroded (EcD2).—Because of the strong slopes, this mapping unit is in capability unit VIe–3.

Edgemont-Chandler channery loams, 20 to 35 percent slopes, severely eroded (EcD3).—The soils in this unit can be used for pasture if proper care is taken, but they should not be cultivated. These soils are in capability unit VIe–3.

Edgemont-Chandler very stony loams, 0 to 20 percent slopes (EdC).—This mapping unit is a mixture of very stony Edgemont, Chandler, and Dekalb soils that have many boulders and rock outcrops. The Edgemont and Chandler soils are dominant. In this mapping unit are included only those slopes that can be pastured safely. This complex is in capability unit VIs–2.

Edgemont-Chandler very stony loams, 20 to 60 percent slopes (EdE).—These mixed very stony soils are not suitable even for grazing. They are in capability unit VIIs–3.

Elioak Series

The Elioak series consists of deep, well-drained, very strongly developed soils. The parent material weathered from mica schist that contained some quartzite impurities. It is similar to the material from which the Manor, Glenelg, and Chester soils have developed. The Manor soils have weak or immature development, the Glenelg moderate, the Chester strong, and the Elioak the strongest development and most mature profile of any of these soils on mica schist.

The Elioak soils occupy uplands in the rolling Piedmont Plateau in the eastern and southern parts of Frederick County. They are good agricultural soils, but are of little importance because of their small extent. Most areas are cultivated. There still remains a little forest, which is dominated by oaks, but also contains many hickories, dogwoods, and other trees, and an undergrowth of huckleberries.

The following description is of a profile of Elioak gravelly loam in a forested area on Chestnut Grove Road 1.1 miles north of its intersection with Liberty Road at Chestnut Grove.

Surface soil—

A_1 0 to 1 inch, very dark grayish-brown (10YR 3/2) gravelly loam; moderate, fine, granular structure; soft when dry, soft to very friable when moist, slightly plastic but nonsticky when wet; roots abundant; many fine and medium and a few larger pores; strongly acid; abrupt wavy boundary; 0 to 3 inches thick.

A_2 1 to 6 inches, brown (10YR 5/3) gravelly loam; moderate, fine, granular structure; slightly hard when dry, very friable when moist, and slightly plastic and slightly sticky when wet; roots plentiful; many fine and medium and some larger pores; medium acid; abrupt wavy boundary; 3 to 6 inches thick.

Subsoil—

B_{21} 6 to 14 inches, strong-brown (7.5YR 5/6) gravelly silt loam; weak to moderate, fine, subangular blocky structure; slightly hard when dry, friable when moist, and plastic and very sticky when wet; roots few; many fine and medium pores; very strongly acid; gradual wavy boundary; 6 to 10 inches thick.

B_{22} 14 to 28 inches, yellowish-red (5YR 5/6), gravelly, heavy silt loam to silty clay loam; moderate, fine to medium, subangular blocky structure; slightly hard when dry, friable to somewhat firm when moist, and plastic and very sticky when wet; very few roots; many fine and medium pores; continuous clayskins; very strongly acid; gradual wavy boundary; 10 to 18 inches thick.

B_{23} 28 to 40 inches, streaked yellowish-red and reddish-yellow (5YR 4/8 and 5YR 6/6) gravelly silty clay loam; moderate to strong, medium, subangular blocky structure; moderately hard when dry, firm when moist, and plastic and sticky when wet; practically no roots; many fine and medium pores; contains a few pieces of soft schist and a considerable amount of mica flakes; discontinuous clayskins; very strongly acid; gradual wavy to irregular boundary; 10 to 16 inches thick.

Substratum—

C 40 to 80 inches +, yellowish-red (5YR 5/8) silty clay loam strongly streaked and spotted with yellow (10YR 7/6); weak, blocky structure, cut across by cleavage planes of the schist; hard when dry, firm when moist, and very plastic and very sticky when wet; contains a few large tree roots; moderately slowly permeable; consists of soft, decomposed schist that feels highly micaceous and greasy; very strongly acid.

Plowed areas are brown if uneroded. They are reddish-brown to yellowish-red if subsoil is mixed with the surface layer. The gravel consists of white quartzite. Some areas are more strongly red in the subsoil.

Elioak gravelly loam, 3 to 8 percent slopes, moderately eroded (EeB2).—This is the typical Elioak gravelly loam. Most of it is in forest. It is a good agricultural soil, and it belongs in capability unit IIe–4.

Elioak gravelly loam, 8 to 15 percent slopes, moderately eroded (EeC2).—Some areas of this soil have less than the normal amount of gravel in the surface soil. The soil is in capability unit IIIe–4.

Elioak silt loam, 0 to 3 percent slopes, moderately eroded (EgA2).—The profile of this soil is like that described for the series, except that the surface layer is somewhat finer in texture and contains very little or no gravel. This soil is in capability unit I–4.

Elioak silt loam, 3 to 8 percent slopes, moderately eroded (EgB2).—This soil is in more danger of further

erosion that the soil just described. Some spots have a loam instead of silt loam surface texture. The soil is in capability unit IIe–4.

Elk Series

The Elk series consists of rather deep, moderately well developed, well-drained soils that have developed on old alluvial terraces from fine materials washed from soils derived from limestone. The parent material was similar to that of the Huntington soils. The Huntington soils are on flood plains, and they show no real profile development.

The Elk soils are fairly extensive in Frederick County. They occur on old terraces of the Potomac and Monocacy Rivers. They are moderately fertile to rather highly fertile, and they have moderately high moisture-supplying capacity. They are fairly productive under good management. Most of the acreage is used for general crops or pastures, but a few small spots are still in forest.

The following generalized description of the profile of Elk loam represents the series as it occurs in cultivated areas on the terraces of the Monocacy River.

Surface soil—

A_p 0 to 7 inches, grayish-brown (10YR 5/2) loam to light silt loam; moderate, medium, crumb structure; slightly hard when dry, friable when moist, and plastic and slightly sticky when wet; roots abundant; moderately permeable; medium acid; clear smooth boundary.

Subsoil—

B_{21} 7 to 22 inches, dark yellowish-brown (10YR 4/4) slightly gritty silt loam; weak, fine, subangular blocky structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots fairly plentiful; moderately permeable; strongly acid; gradual wavy boundary.

B_{22} 22 to 37 inches, yellowish-brown (10YR 5/6) silt loam; moderate, fine to medium, subangular blocky structure; moderately hard to hard when dry, rather firm when moist, and plastic and sticky when wet; very few roots; moderately slowly permeable; contains some gravel and a few pockets of sand in lower part; strongly acid; clear wavy boundary.

Substratum—

CD 37 to 44 inches +, light yellowish-brown (10YR 6/4) gravelly to very gravelly fine sandy loam to silt loam that is somewhat streaked and mottled with light gray and with a few splotches of red; structureless; moderately hard to hard when dry, firm when moist, and slightly plastic and slightly sticky when wet; no roots; moderately to rather rapidly permeable; consists of more or less unaltered old river deposits; rounded gravel is waterworn and consists mostly of chert; reaction varies but is strongly acid in most places.

Small to medium-sized waterworn chert fragments are fairly common in these soils. They are numerous in Elk gravelly loam. Included are some small areas that have much more weakly developed textural profiles. These included soils probably belong to the Ashton series, but they were not mapped separately.

Elk gravelly loam, 3 to 8 percent slopes, moderately eroded (EhB2).—This soil has a profile like that described under the series, except that there are considerable amounts of smooth, rounded gravel throughout the profile. The soil is in capability unit IIe–1.

Elk loam, 0 to 3 percent slopes (EkA).—This soil has a profile like that described. It is a very good soil. Although not so fertile as some of the soils developed directly on limestone, it is highly productive under good management. It is in capability unit I–1.

Elk loam, 3 to 8 percent slopes, moderately eroded (EkB2).—Except for the effects of erosion, this soil is like Elk loam, 0 to 3 percent slopes. It is in capability unit IIe–1.

Elk loam, 8 to 15 percent slopes, moderately eroded (EkC2).—Some areas of this soil are somewhat gravelly. The soil is in capability unit IIIe–1.

Fauquier Series

The Fauquier series consists of deep, well-drained, very strongly developed, medium-textured soils. The parent materials weathered from a crystalline metamorphosed rock, called greenstone or metabasalt, that contains large amounts of basic plant nutrients. The Fauquier soils occur on uplands in the western part of the county. They are mapped on parts of Catoctin Mountain, throughout the Middletown Valley, and northward to the Pennsylvania State line. They are closely associated with the Myersville and Highfield soils, but they are more intensely weathered, redder in color, stronger in structure, and more plastic in the subsoil. The Fauquier soils are as productive as the Myersville, and the two soils dominate in the agriculture of the rich Middletown Valley. Originally, the Fauquier soils supported dense hardwood forests of excellent quality, but practically all the acreage except the steep or stony areas has been cleared for farming.

The following profile of Fauquier loam was taken in a cultivated area on Cherry Lane, four-tenths of a mile west of its intersection with Holter Road.

Surface soil—

A_p 0 to 8 inches, dark-brown (7.5YR 3/2) loam; strong, fine, crumb structure; moderately hard when dry, very friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; neutral; gradual smooth boundary; 6 to 10 inches thick.

Subsoil—

B_{21} 8 to 26 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, fine, subangular blocky structure; hard when dry, moderately firm when moist, and sticky and very plastic when wet; roots rather few; many fine and some larger pores; medium acid; gradual wavy boundary; 12 to 26 inches thick.

B_{22} 26 to 46 inches, yellowish-red (5YR 4/6) silty clay loam; strong, medium, subangular blocky structure; very hard when dry, firm when moist, and sticky and very plastic when wet; roots very few; many fine but few larger pores; continuous clay-skins of the same color; medium acid; gradual wavy boundary; 18 to 24 inches thick.

Substratum—

C_1 46 to 60 inches, red (2.5YR 4/6) highly micaceous silty clay loam, finely but distinctly mottled with gray, black, and yellowish red; strong, thick, platy structure; hard when dry, firm when moist, and sticky, very plastic, and distinctly greasy when wet; no roots; many fine pores; slightly acid; gradual wavy boundary; 12 to 24 inches thick.

C_2 60 inches +, yellowish-red (5YR 5/8) very micaceous, disintegrated schist finely mottled with bright red, dull brown, and greenish gray; structureless; moderately hard to hard when dry, firm when

moist, and plastic, sticky, and very greasy when wet; no roots; moderately slowly permeable; slightly acid to medium acid.

The platy structure of the substratum is inherited from the underlying schist. All Fauquier soils, even those not classified as gravelly, contain some white quartzite gravel. In many places the gravel is concentrated in the upper part of the B horizon. There are scattered outcrops of greenstone. In some areas the soil is redder than that described, and in others it is less red. The stony soils of this series occur almost entirely in the mountains or higher valley areas.

Fauquier gravelly loam, 0 to 3 percent slopes (FaA).—This soil is 15 to 30 percent gravel, mostly white quartzite. The white gravel is particularly conspicuous in plowed fields after rains, as it stands out against the background of the darker colored soil material. This soil is only slightly eroded. It is an excellent soil for crops. It is in capability unit I–4.

Fauquier gravelly loam, 3 to 10 percent slopes, moderately eroded (FaB2).—This is an extensive soil, and it is in capability unit IIe–4. Six acres are severely eroded.

Fauquier gravelly loam, 10 to 20 percent slopes, moderately eroded (FaC2).—This soil is moderately eroded, except for 34 acres that are severely eroded. It is in capability unit IIIe–4.

Fauquier gravelly loam, 20 to 35 percent slopes, moderately eroded (FaD2).—Most of this soil is gravelly, but several small areas have very little gravel in the surface layer. This soil is in capability unit VIe–2.

Fauquier gravelly loam, 20 to 45 percent slopes, severely eroded (FaE3).—Because of the severe erosion, cultivating this soil is impractical and hazardous. With care, however, some hay crops could be produced, and grazing could be permitted. This soil is in capability unit VIe–3.

Fauquier loam, 0 to 3 percent slopes (FbA).—This soil is the one described as typical of the series. It is a strong, productive soil and one of the best in the Middletown Valley. It is fairly easy to manage. It is in capability unit I–4.

Fauquier loam, 3 to 8 percent slopes, moderately eroded (FbB2).—This is a strong agricultural soil and is fairly easy to manage. An area of about 4 acres is severely eroded. Because of the moderate erosion hazard, this soil is in capability unit IIe–4.

Fauquier loam, 8 to 15 percent slopes, moderately eroded (FbC2).—Most of this soil can be cultivated if carefully managed. It is capability unit IIIe–4. The 79 acres shown on the soil map as more severely eroded should be kept in permanent vegetation.

Fauquier loam, shallow, 8 to 15 percent slopes, moderately eroded (FcC2).—The subsoil is thin, and in most places the underlying decayed rock is within 20 inches of the surface. Because of the slope, the erosion hazard, and shallowness, this soil should be used for cultivated crops only under the most careful management. It is in capability unit IVe–10.

Fauquier loam, shallow, 15 to 45 percent slopes, moderately eroded (FcE2).—This steep, shallow soil is not suited to either crops or pasture. It is in capability unit VIIe-3. Two acres have slopes of slightly more than 45 percent.

Fauquier silt loam, 0 to 3 percent slopes (FdA).—The profile of Fauquier silt loam is like that of Fauquier loam except that the surface layer contains much more silt and less sand. The silt loams may be a little stronger and more fertile than the loams or gravelly loams.

All of this unit is in the Middletown Valley. It can be intensively cultivated without special management practices to control erosion. This soil is in capability unit I–4.

Fauquier silt loam, 0 to 10 percent slopes, moderately eroded (FdB2).—This is the most extensive soil in the Fauquier series and one of the most important soils in the Middletown Valley. Erosion is a hazard, however, and for this reason the soil is placed in capability unit IIe–4. The 75 acres that are severely eroded need especially careful management.

Fauquier silt loam, 10 to 20 percent slopes, moderately eroded (FdC2).—Because of the greater erosion hazard, this soil is in capability unit IIIe–4. In small, widely scattered spots are 81 acres that are severely eroded.

Fauquier silt loam, 20 to 35 percent slopes, moderately eroded (FdD2).—These strong slopes are generally unsuitable for cultivation. This soil is in capability unit VIe–2.

Fauquier silty clay loam, 10 to 20 percent slopes, very severely eroded (FeC4).—This soil probably once had a silt loam surface layer, but most of the silty material has been removed by erosion. Subsequent plowing turned up the subsoil and made the new plow layer finer in texture, more sticky, and more difficult to manage. There are many gullies, some of which have been stabilized. Cultivating this soil is very hazardous. It should be kept in permanent vegetation and can be used for hay or pasture. It is in capability unit VIe–3.

Fauquier silty clay loam, 20 to 35 percent slopes, severely eroded (FeD3).—This soil should not be cultivated. It is in capability unit VIe–3.

Fauquier silty clay loam, 20 to 45 percent slopes, very severely eroded (FeD4).—This soil should be used only for very limited grazing or for forestry. It is in capability unit VIIe–3.

Fauquier very stony loam, 0 to 20 percent slopes, moderately eroded (FgC2).—This soil occurs mostly on the northern parts of Catoctin Mountain and in the high valleys just to the west. It is too stony for ordinary cultivation. The gentler slopes, however, make good grazing land, even though management is difficult. This soil is in capability unit VIs–2.

Fauquier very stony loam, 20 to 50 percent slopes, moderately eroded (FgE2).—This soil is so steep and so stony that it should be kept in trees. Most of it is now forested. It is in capability unit VIIs–3.

Frankstown Series

The Frankstown soils developed from impure limestones in the Frederick Valley. They are well drained, fertile, highly productive, and easy to manage. They are used chiefly for grain, hay, and pasture, but they are suitable for all the crops of the county.

No separate profile of Frankstown soil is described

in this survey. The profile of Frankstown silt loam is very much like the profile of Duffield silt loam described under that series, but it is shallower and contains more shale chips or cherty gravel. The Duffield and Frankstown soils differ so slightly that it is difficult to separate them. The only Frankstown soils mapped in Frederick County are in undifferentiated units with the Duffield soils. The separate units are described under the Duffield series.

Glenelg Series

The Glenelg series consists of moderately deep, moderately well developed, well-drained soils. They were derived from materials weathered from micaceous schists, most of which contained considerable quartzite. They occur on the undulating to hilly Piedmont uplands in the eastern and southern parts of Frederick County.

The Glenelg soils are more deeply and strongly weathered than the Manor soils with which they are chiefly associated, but the parent materials are the same or very similar. Glenelg soils have more strongly developed profiles than the Manor soils, but they are not so strongly developed as the Chester and Elioak soils, which occur on the same formations.

Several thousand acres of Glenelg soils were mapped in Frederick County. The greatest part is in cultivation. Smaller areas are in pasture or forest. The forests are dominated by oaks; they also contain considerable locust, dogwood, hickory, and poplar.

The following profile of Glenelg gravelly loam is representative of the series. It is in a forested area one-fourth of a mile north of the intersection of Emerson Road and Mapleville Road.

Surface soil—

A_1 0 to 2 inches, very dark brown (10YR 3/3) gravelly loam; moderate, fine, granular structure; soft when dry, very friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many pores of all sizes; strongly acid; clear wavy boundary; 1 to 3 inches thick.

A_2 2 to 6 inches, dark yellowish-brown (10YR 4/4) gravelly loam; weak, medium, crumb structure; very slightly hard when dry, very friable when moist, and sticky and slightly plastic when wet; roots plentiful to abundant; many fine and medium and a few larger pores; contains medium and fine to very fine gravel, schist fragments, and quartzite; strongly acid; clear wavy boundary; 3 to 6 inches thick.

Subsoil—

B_{21} 6 to 13 inches, strong-brown (7.5YR 5/6) gravelly silt loam to silty clay loam; weak, fine, subangular blocky structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; a few large tree roots; numerous fine and medium pores; strongly acid; diffuse wavy boundary; 6 to 9 inches thick.

B_{22} 13 to 22 inches, strong-brown (7.5YR 5/6) gravelly silty clay loam; strong, medium, subangular blocky structure; moderately hard when dry, moderately firm when moist, and plastic and sticky when wet; a few large roots; many fine and some medium pores; discontinuous self-colored clayskins; strongly acid; gradual irregular boundary; 8 to 14 inches thick.

Substratum—

C 22 to 40 inches, yellowish-red (5YR 5/6) decomposed schist, highly micaceous; considerable infiltration of silt and clay; has structure of the original schist; moderately hard to hard when dry, firm when moist, and plastic and sticky when wet; no roots; moderately permeable; strongly acid; clear to abrupt irregular boundary; 10 inches to several feet thick.

D_r 40 inches +, hard phyllitic mica schist; a few veins of hard, white quartzite.

Uneroded areas that have been cultivated have a yellowish-brown surface layer. Eroded areas, where subsoil material is mixed into the plow layer, have a brown or reddish-brown surface layer.

Besides Glenelg gravelly loam, there are in the county large areas of Glenelg loam and silt loam, which are mapped in undifferentiated groups with Chester loam and silt loam. The two kinds of soils are closely associated, and the differences between them are not apparent in the field. The principal difference is the depth to the substratum. For a description of the Chester soils, see the Chester series.

Glenelg gravelly loam, 0 to 8 percent slopes, moderately eroded (GaB2).—This is the soil described under the series. It is slightly to moderately eroded. Most of it is cultivated, but some areas remain in forest. It is in capability unit IIe–4.

Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded (GaC2).—This soil has a profile like that described, but it is more likely to erode. Included are 32 acres that are severely eroded and should be kept in permanent cover. This soil is in capability unit IIIe–4.

Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded (GaD2).—This soil can be cultivated on a limited basis. It is in capability unit IVe–25.

Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded (GaD3).—This soil is so severely eroded that cultivation is impractical. It is in capability unit VIe–3.

Glenelg gravelly loam, 15 to 45 percent slopes, very severely eroded (GaE4).—This soil is so severely eroded that none of it should even be pastured. Sheet erosion is severe to very severe. Gullies are common, but most of them are not deep. This soil is in capability unit VIIe–3.

Glenelg and Chester loams, 3 to 8 percent slopes, moderately eroded (GbB2).—The Glenelg soil in this unit has a profile like that of the Glenelg gravelly loams, except that it has little or no gravel on the surface or in the profile. These are productive soils, and almost all of the areas are cultivated. Because of their slope and susceptibility to erosion, they are in capability unit IIe–4.

Glenelg and Chester loams, 8 to 15 percent slopes, moderately eroded (GbC2).—Most of this mapping unit has been moderately eroded. None of it has been severely eroded. The slope constitutes a distinct erosion hazard, however, so this mapping unit is placed in capability unit IIIe–4.

Glenelg and Chester loams, 15 to 25 percent slopes, moderately eroded (GbD2).—This mapping unit can be safely cultivated only occasionally. It is in capability unit IVe–25.

Glenelg and Chester silt loams, 0 to 3 percent slopes, moderately eroded (GcA2).—The soils in this undifferentiated mapping unit have profiles like those of the

Glenelg and Chester loams, except that the surface soil is much more silty. In most places the silt loams are somewhat deeper and slightly more reddish in color than the loams or gravelly loam. Practically all of this unit is in cultivation. These soils are so responsive and so easily managed that they are placed in capability unit I–4.

Glenelg and Chester silt loams, 3 to 8 percent slopes, moderately eroded (GcB2).—Erosion is slight to moderate. The soils are productive and easily managed, but there is some hazard of erosion. They are in capability unit IIe–4.

Glenelg and Chester silt loams, 8 to 15 percent slopes, moderately eroded (GcC2).—The erosion hazard is greater on these soils than on those just described. One acre is so severely eroded that it should be in trees or other permanent cover. These soils are in capability unit IIIe–4.

Glenelg and Chester silt loams, 15 to 45 percent slopes, moderately eroded (GcD2).—Only a few acres of these soils have slopes of more than 25 percent, so the mapping unit as a whole is in capability unit IVe–3. It is suitable for limited cultivation. Erosion is not severe, except on 42 acres. These areas should be reserved for woodlots.

Glenville Series

The Glenville series consists of deep, moderately well drained soils that have a moderately well developed siltpan or fragipan. The root zone is only moderately deep because of this dense horizon. The subsoil developed from materials weathered in place from rather soft micaceous schists, from a harder mica schist known as phyllite, and in some places from gneiss. The surface soil is mostly colluvial material washed from adjacent higher soils, mainly those of the Manor and Glenelg series.

The Glenville soils occupy slightly depressed areas, normally around or above the heads of streams, but they also occur in upland depressions or on foot slopes above drainageways. They are fairly extensive and occur in small, scattered areas on the Piedmont Plateau. Practically all of the acreage has been cleared, but there is some second-growth forest consisting mainly of elms, maples, willows, and a few alders.

The following profile of Glenville silt loam was observed in an area of second-growth forest at the head of the drainage area for one branch of Linganore Creek, a quarter of a mile south of United States Highway No. 40, on the Ijamsville Road.

Surface soil—

A_1 0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam that contains scattered small specks of gray and rusty brown; weak, fine, crumb structure; hard when dry, friable when moist, and plastic and sticky when wet; roots abundant; many fine and a few medium and larger pores; strongly acid; clear to abrupt smooth boundary; 7 to 10 inches thick.

Subsoil—

B_{21} 10 to 24 inches, light olive-brown (2.5Y 5/6) silty clay loam that has a few horizontal, faint gray streaks; moderate, fine, subangular blocky structure; hard when dry, firm when moist, and sticky and very plastic when wet; few roots; many fine pores; medium acid; clear smooth to wavy boundary; 12 to 18 inches thick.

B_{22m} 24 to 38 inches, yellowish-brown (10YR 5/6) silty clay loam that has many, medium, distinct mottlings of yellow and light brownish gray (10YR 7/8 and 2.5Y 6/2); moderate, medium, subangular blocky structure in upper part, platy in lower part; hard when dry, firm but brittle when moist, and plastic and sticky when wet; no visible roots; a few fine pores; slightly acid; abrupt smooth to wavy boundary; 14 to 24 inches thick.

Substratum—

C 38 to 44 inches, light olive-brown (2.5Y 5/6) silty clay loam that forms a matrix for highly mottled decomposed schist, mostly gray, reddish brown, and black; medium to thick platy structure; slightly hard when dry, friable when moist, and sticky and slightly plastic when wet; no roots; contains much mica, which makes the layer feel greasy; strongly acid; abrupt smooth to wavy boundary; 4 to 12 inches thick.

D, 44 inches +, thinly laminated hard mica-schist, which in this profile has vertical laminations.

The A horizon varies considerably in thickness. The speckled appearance of the A_1 horizon is apparently caused by vegetable material buried by the accumulation of colluvium. Also, the colluvial action probably explains the absence of a bleached A_2 horizon. In some places the upper part of the panlike B_{22m} horizon is more compacted and somewhat more firm, and it may contain some small black concretions. The platy structure in the C horizon is inherited from the decomposed schist in the parent material.

The Glenville soils have rather low fertility. They are alternately fairly wet or very dry because the movement of water through the subsoil is restricted. They are generally more suitable for pasture or hay than for most cultivated crops.

Glenville silt loam, 0 to 8 percent slopes (GdB).—This comparatively uneroded soil occurs in small depressions or near the centers of larger depressions. The surface soil in some places is more than 10 inches thick. Most of this soil is uneroded, but some areas have a little rilling or a few small gullies that can be controlled by usual farming methods. Because this soil has impeded drainage and is sometimes very wet, it is put in capability unit IIw–1.

Glenville silt loam, 3 to 8 percent slopes, moderately eroded (GdB2).—Both drainage and erosion control are needed if this soil is cultivated. Erosion control is the more serious problem. Small gullies are common. They enlarge rapidly unless runoff is controlled. This soil is in capability unit IIIe–13. About 24 acres of this soil have slopes of a little more than 8 percent.

Glenville very stony silt loam, 0 to 8 percent slopes (GeB).—As a result of colluvial action, almost enough stones have accumulated in this soil to prevent cultivation or the use of any mechanized equipment. Because it is very stony and fairly wet at times, this soil is in capability unit VIs–2.

Guthrie Series

The Guthrie series consists of well-developed, poorly drained, shallow to moderately deep soils developed on materials weathered from limestone of various degrees of purity. In most places the surface has been modi-

fied by an accumulation of fine material washed from higher slopes.

The Guthrie soils occupy upland flats or slight depressions within limestone areas. They are inextensive and of little importance in Frederick County. They are alternately very wet or very dry, are of fairly low fertility, and are difficult to work. They are commonly used for pasture or for hay. Little if any of the acreage is used for corn and other crops.

The following profile of Guthrie silt loam was taken in an abandoned pasture on Putman Road, three-tenths of a mile west of its intersection with Emmitsburg Road (United States Highway No. 15) just west of Lewistown.

Surface soil—

A_p 0 to 10 inches, olive-gray (5Y 5/2) silt loam; strong, fine, crumb structure; very hard when dry, compact but friable when moist, and plastic and slightly sticky when wet; roots plentiful; many fine and medium pores; mildly alkaline; clear to abrupt smooth boundary; 6 to 10 inches thick.

Subsoil—

B_{21g} 10 to 16 inches, light olive-gray (5Y 6/2) silty clay loam to silty clay that has scattered, medium, faint mottles of olive yellow (2.5Y 6/6); moderate, fine, blocky structure; very hard when dry, firm and compact when moist, and plastic and very sticky when wet; roots few; fine pores but few larger pores; mildly alkaline; gradual smooth boundary; 4 to 8 inches thick.

B_{22g} 16 to 31 inches, gray (5Y 5/1) heavy clay loam to clay that has many, distinct, fine and medium mottles of olive brown and yellowish brown (2.5Y 4/4 and 10YR 5/4); strong, medium, blocky structure; very hard to extremely hard when dry, very firm and compact when moist, and very plastic and very sticky when wet; practically no roots; only a few fine pores; medium acid; gradual smooth boundary; 10 to 20 inches thick.

Substratum—

C_g 31 to 42 inches +, dark-gray (5Y 4/1) gritty clay that has a bluish cast and contains scattered small mottles of olive brown (2.5Y 4/4); rather strong, coarse, blocky structure; extremely hard when dry, very firm and compact when moist, and very plastic and very sticky when wet; no roots; very slowly permeable; contains enough sand to feel gritty; neutral; grades with depth into shaly limestone.

The surface soil may be either more brown or more gray than that of the profile described. The depth to and the thickness of the B_{22g} horizon varies considerably over short distances. Chert fragments are scattered through the profile. Lenses of sand are found in a few places in the upper part of the profile. In some places the subsoil structure is somewhat flattened or platy. Although this soil is poorly drained, its moisture-supplying capacity is quite low.

Guthrie silt loam, 0 to 3 percent slopes (GgA).—Only one unit of Guthrie soil is mapped in Frederick County. None of it is suitable for cultivation, but if managed well it could make fairly good pasture. It is in capability unit Vw–2.

Hagerstown Series

The Hagerstown series consists of deep, strongly developed, well-drained soils. Most of the parent material was derived from rather hard pure limestone. In some places, however, the limestone contained some sand, and in other places it contained some fragments of chert.

The Hagerstown soils occur in the broad, shallow Frederick Valley, with the more extensive Duffield and Frankstown soils. All of the acreage has been cleared. Practically all areas that are not inside the city of Frederick are used for crops or high-quality pasture. These soils are highly productive if well managed.

The following profile of Hagerstown silt loam was taken in a cultivated area on Willis Derr Road, four-tenths of a mile east of its intersection with New Design Road, about 1¼ miles northwest of Lime Kiln.

Surface soil—

A_p 0 to 7 inches, brown (7.5YR 5/4) silt loam; strong, medium to coarse, crumb structure; moderately hard when dry, friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and medium pores; neutral; abrupt wavy boundary; 5 to 8 inches thick.

Subsoil—

B_{21} 7 to 21 inches, yellowish-red (5YR 5/8) heavy silty clay loam to clay loam; strong, fine, subangular blocky structure; hard when dry, firm when moist, and plastic and sticky when wet; roots plentiful in upper part, few in lower part; many fine but few larger pores; slightly acid to neutral; gradual wavy boundary; 12 to 27 inches thick.

B_{22} 21 to 38 inches, variegated yellowish-red to strong-brown (5YR 5/6 and 7.5YR 5/6) heavy clay loam to clay; very strong, fine to medium, subangular blocky structure; very hard when dry, very firm when moist, and plastic and sticky when wet; very few roots; many fine but few larger pores; black clayskins are common; clayskins of the same color as the inside of the aggregates are almost continuous; strongly acid; clear wavy boundary; 15 to 24 inches thick.

Substratum—

C 38 to 60 inches, +, mottled yellowish-red and reddish-yellow (5YR 5/6 and 7.5YR 6/6) clay loam to clay; massive, or in some places very weak, coarse, blocky structure; very hard when dry, very firm when moist, and plastic and sticky when wet; no roots; slowly permeable; strongly acid; very thick.

The normal Hagerstown soil is quite deep, but in spots the limestone bedrock is near the surface, and some places have numerous outcrops of limestone.

Hagerstown gravelly loam, 0 to 3 percent slopes (HaA).—The surface layer of this soil is about 15 to 20 percent medium and coarse gravel. The gravel is mostly chert. In some areas, the chert appears to be waterworn. These areas probably belong to the Etowah series, but they could not be accurately separated from the Hagerstown soil, and the Etowah series was not mapped separately in this county. The inclusion of these spots of Etowah soils does not affect capability and management. This soil is in capability unit I–1.

Hagerstown gravelly loam, 3 to 8 percent slopes, moderately eroded (HaB2).—This soil is in capability unit IIe–1. Included, however, are 15 acres that are somewhat severely eroded and that need more careful management.

Hagerstown gravelly loam, 8 to 15 percent slopes, moderately eroded (HaC2).—Because the erosion hazard is greater than for the other Hagerstown gravelly loams, this soil is in capability unit IIIe–1. Several acres have slightly more than 15 percent slopes.

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Hagerstown loam, 0 to 3 percent slopes (HbA).—The profile of this soil is like that of the silt loam described under the series, but the surface soil contains enough sand and fine sand to have a loam instead of a silt loam texture. All horizons are sandier than the profile described, probably because of sandy impurities in the limestone parent rock. Some areas near streams probably belong to the Etowah series, but these could not be accurately separated on the soil map. This fertile and productive unit is in capability unit I–1.

Hagerstown loam, 0 to 8 percent slopes, moderately eroded (HbB2).—This is the most extensive Hagerstown soil in this county, and all of it is excellent farmland. Nearly all of it is moderately eroded and is in capability unit IIe–1. Included are 14 acres that are more severely eroded. These areas should receive special treatment.

Hagerstown loam, 8 to 15 percent slopes, moderately eroded (HbC2).—The greater erosion hazard causes this soil to be in capability unit IIIe–1.

Hagerstown loam, 15 to 25 percent slopes, moderately eroded (HbD2).—This is the steepest of the Hagerstown loams, but it is not seriously eroded. It is in capability unit IVe–1. About 56 acres of it have a slightly finer or siltier surface than is normal for Hagerstown loams.

Hagerstown rocky loam, 3 to 15 percent slopes, moderately eroded (HdB2).—This soil consists of shallow areas of Hagerstown loam and silt loam that have so many outcrops of limestone that ordinary cultivation is impractical or impossible. There may be a few loose stones or boulders, but most of the rocks are ledges or reefs of limestone. Slopes are not great and erosion is not severe. Most of this soil can be used for pasture or, in a very limited way, for hay and other crops. It is in capability unit VIs–1.

Hagerstown rocky clay, 8 to 15 percent slopes, severely eroded (HcC3).—This soil has been so severely eroded that the old clay subsoil is now exposed. It should not be used for crops, but it could make good pasture with proper management. This soil is in capability unit VIs–1.

Hagerstown rocky clay, 15 to 25 percent slopes, severely eroded (HcD3).—This soil is too steep, rocky, and badly eroded even for good pasture. It will make good woodlots if reforested. It is in capability unit VIIe–1.

Hagerstown silt loam, 0 to 3 percent slopes (HeA).—The profile of this soil is described under the series. It is one of the best agricultural soils of the county. It has little or no erosion. It is in capability unit I–1.

Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded (HeB2).—This is the most extensive of the Hagerstown silt loams. The soil is excellent, but the past erosion and the erosion hazard cause it to be put in capability unit IIe–1. Included are about 4 acres that are more severely eroded and that should be treated as if they were in capability unit IIIe–1.

Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded (HeC2).—All but 1 acre is moderately eroded. The 1 acre is so severely eroded that it should be kept in permanent vegetation. The soil is in capability unit IIIe–1.

Highfield Series

Soils of the Highfield series are well drained and fairly deep. They developed on materials weathered from metabasalt, also known as greenstone or Catoctin schist. This greenstone contains considerable amounts of quartzite. As a result, most Highfield soils are at least gravelly or channery, and large areas are very stony.

The Highfield soils developed from rocks similar to the parent rocks of the Myersville soils of the Middletown Valley, but the greenstone includes more impurities of quartzite. The Highfield soils are somewhat less deep than the Myersville soils, and they are more yellowish brown than brown in the subsoil. The Highfield soils are less strongly developed than the Myersville, and their structure is weaker.

Some of the Fauquier soils are also associated with the Highfield soils. They are somewhat similar, but the Fauquier soils are much redder and have a more strongly developed profile.

The Highfield soils occur chiefly on spurs of the low Blue Ridge Mountains and on intermountain areas at rather high elevations in the northern and northwestern parts of the county.

These are fertile and productive soils. Their use is limited chiefly by steepness or stoniness or both. Most of the nonstony areas are cultivated or used for pasture. The largest stony areas are in forest, which is dominated by chestnut oak but contains many other oaks, a few hemlocks, and a ground cover of ferns.

This profile of Highfield very stony loam was observed in a forest near Crystal Fountain Road, $1\frac{3}{10}$ miles west of its intersection with Rifle Road, just west of Emmitsburg.

Surface soil—

A_1 0 to 6 inches, very dark brown (10YR 2/2) very stony loam; weak, fine, crumb structure; soft to very slightly hard when dry, loose to very friable when moist, and slightly plastic and very slightly sticky when wet; roots abundant; many pores of all sizes; medium acid; clear irregular boundary; 2 to 7 inches thick.

A_2 6 to 10 inches, dark-brown (10YR 3/3) very stony loam; weak, fine, crumb to granular structure; slightly hard when dry, very friable when moist, and slightly plastic and slightly sticky when wet; roots plentiful; many pores of all sizes; strongly acid; clear irregular boundary; 3 to 6 inches thick.

Subsoil—

B_{21} 10 to 24 inches, dark yellowish-brown (10YR 4/4) stony heavy loam to silt loam; weak, fine, subangular blocky structure; slightly hard when dry, rather compact but friable when moist, and plastic and slightly sticky when wet; few roots; many fine and medium pores; very strongly acid; gradual irregular boundary; 8 to 14 inches thick.

B_{22} 24 to 39 inches, strong-brown (7.5YR 5/6) stony silt loam; moderate, fine, subangular blocky structure; moderately hard when dry, compact but friable when moist, and plastic and sticky when wet; a few large tree roots; many fine and a few medium pores; very strongly acid; gradual to clear irregular boundary; 10 to 20 inches thick.

B_3 39 to 50 inches, brownish-yellow (10YR 6/8) stony silt loam to silty clay loam; weak, coarse, subangular blocky structure; moderately hard to hard when dry, somewhat brittle but friable when moist, and plastic and sticky when wet; no roots; rather slowly permeable; few visible pores; contains probably 50 percent partly decomposed

greenish to brownish metabasalt and some hard metabasalt; very strongly acid; abrupt irregular to broken boundary; 10 to 25 inches thick.

Substratum—

D_r 50 inches +, hard, green metabasalt or greenstone containing many white quartzite impurities.

Rock outcrops and surface boulders are common on this soil. Other types of this series are much less stony. The depth to bedrock ranges from 30 inches to more than 6 feet. The lower subsoil in some places is less yellow and more brown than described. In many places there is a more distinct C horizon of disintegrated rock than there is in the profile described.

Highfield channery loam, 0 to 10 percent slopes, moderately eroded (HgB2).—The profile of this soil is like that described in detail under the series, except that it is not stony. Instead it contains about 20 to 35 percent of small to medium-sized flat fragments of greenstone schist throughout the soil, and many fragments lie on the surface. Most of this soil is moderately eroded, but 56 acres are somewhat more severely eroded. The soil is in capability unit IIe–25.

Highfield channery loam, 10 to 20 percent slopes, moderately eroded (HgC2).—Most of this soil is only slightly to moderately eroded. The 75 acres that are more severely eroded should be kept under permanent vegetative cover. The soil is in capability unit IIIe–25.

Highfield channery loam, 20 to 35 percent slopes, moderately eroded (HgD2).—This soil is generally unsuited to cultivation. It is in capability unit VIe–3.

Highfield channery loam, 20 to 35 percent slopes, severely eroded (HgD3).—The erosion has been serious enough to ruin this soil for crops. These areas can still be pastured if sod is established and then very carefully managed. The soil is in capability unit VIe–3.

Highfield channery loam, 20 to 35 percent slopes, very severely eroded (HgD4).—This soil is so severely eroded that it can no longer safely be used even for grazing. All of the surface soil is gone. There are many gullies; some of them are very deep and extend to bedrock in some places. These areas should be kept in permanent vegetation. It may be possible to reforest them. This soil is in capability unit VIIe–3.

Highfield channery loam, 35 to 45 percent slopes, moderately and severely eroded (HgE2).—These steep slopes can be pastured safely if carefully managed, but they should never be cultivated. This soil is in capability unit VIIe–3.

Highfield silt loam, 0 to 10 percent slopes, moderately eroded (HhB2).—The surface layer of this soil is much more silty and finer in texture than the surface layer of the profile described under the series. It contains little gravel and very few rock fragments or stones. This is the best Highfield soil in the county. It is stronger and more productive than the other soils of the series and is more easily managed. In some places the surface soil may be a heavy loam instead of a silt loam in texture, but this makes little difference in use or management. This soil is in capability unit IIe–25.

Highfield silt loam, 10 to 20 percent slopes, moderately eroded (HhC2).—Erosion is moderate on most of this soil, but about 20 acres that are more severely eroded are included. These 20 acres should be kept under permanent cover. The rest of the soil can be cultivated with careful management to prevent further soil loss. This soil is in capability unit IIIe–25.

Highfield silt loam, 20 to 35 percent slopes, severely eroded (HhD3).—This soil should never be cultivated, but it is still suitable for grazing if properly managed. It is in capability unit VIe–3.

Highfield very stony loam, 0 to 20 percent slopes (HkC).—The profile of this soil is described under the series. The soil is too stony for cultivation but is suitable for grazing with good management. This soil is in capability unit VIs–2.

Highfield very stony loam, 20 to 45 percent slopes (HkE).—This soil is so steep that it should be used for nothing more intensive than forestry. Most of it is forested now, and should remain so. This large area of stony, mountainous, forested soil is in capability unit VIIs–3.

Huntington Series

The Huntington soils are deep, well-drained soils on flood plains and in upland depressions. Most of them developed from recently deposited fine materials that washed chiefly from areas of Duffield, Hagerstown, Frankstown, and other soils derived from limestone. Other areas of Huntington soils developed from very recent deposits of fine materials that washed or rolled to the foot of slopes and into depressions. This material ranges from very thick near major streams to rather thin along smaller drains and foot slopes.

The Huntington soils are generally fertile, productive, and easy to manage. They are fairly wet in the spring. At rare intervals they may be flooded, but the flood hazard is not great.

Nearly all of these areas have been cleared. They are used mostly for corn or small grains or for high-quality hay and pasture.

The following profile of Huntington silt loam was taken in a small forest on the flood plain between the Monocacy River and Monocacy Bottom Road, one-half mile south of the intersection of Monocacy Bottom Road and Fingerboard Road.

Surface soil—

1. 0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, coarse, crumb structure; moderately hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many fine and medium pores and many worm channels; surface of soil covered with worm casts; neutral; gradual smooth boundary; 8 to 12 inches thick.

Subsoil—

2. 10 to 52 inches, dark-brown (7.5YR 4/4) silt loam; moderate, thin to medium, platy structure; hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots plentiful in upper part; many worm channels; some mica flakes in lower part; slightly acid; gradual smooth boundary; 36 to 60 inches thick.

Substratum—

3. 52 to 84 inches +, dark grayish-brown (10YR 4/2) heavy silt loam to silty clay loam that has common, faint mottles of gray and rusty brown; moderate, medium to thick, platy structure due primarily to stratification; very hard when dry, firm when moist, and plastic and sticky when wet; no roots; many fine pores and some worm channels; many mica flakes; slightly acid to neutral.

Huntington fine sandy loam, 0 to 3 percent slopes (HmA).—This soil is more sandy than the silt loam described under the series, and in a few places it has a very sandy overwash on the surface. It is in capability unit I–6.

Huntington silt loam, 0 to 3 percent slopes (HnA).—This soil has a profile like that described under the series. It is an excellent and strong soil that belongs to capability unit I–6. Only 7 acres have slopes of slightly more than 3 percent.

Huntington silt loam, local alluvium, 0 to 3 percent slopes (HoA).—This soil is in draws and upland depressions and on some foot slopes. It lies in scattered small spots throughout the limestone valley areas of the county. In most places the soil is less deep than the Huntington silt loams of the flood plains, and it has even less hazard of overflow or flood damage. It is in capability unit I–1. About 18 acres have slopes somewhat greater than 3 percent, but this makes little difference in use or management.

Lansdale Series

The Lansdale soils in Frederick County are so intricately associated with soils of the Penn series that they are mapped only in complexes with the Penn soils. The parent materials of the two series are similar, except that the shale and sandstone underlying the Lansdale soils is lighter in color. The Penn soils are red, but the Lansdale soils are brown to yellowish brown or, in some places, grayish brown. In use, capability, and management, the two series are similar.

No profile of Lansdale soil was described in this report, but the profile of Penn silt loam described under that series is similar to a profile of Lansdale silt loam except for color. The units that contain Lansdale soils are described under the Penn series.

Lantz Series

The Lantz series contains rather deep but very poorly drained soils. The lower layers of the soil developed from schist bedrock, and the surface layer is composed mostly of fine materials washed from nearby higher soils. Lantz soils are similar to the moderately well drained Glenville soils and the poorly drained Worsham soils, but they are more poorly drained and darker in the surface layer than either.

The Lantz soils are neither extensive nor important. They occur in small scattered areas in upland depressions, around drainage heads, and on nearly level foot slopes along small drainageways. These soils are mapped on the Piedmont Plateau and the low intermountain areas in the northwestern part of the county.

These are poor soils, not suitable for crops. With drainage and special management, they can make fairly good pasture. The native vegetation was willows, alders, swamp maple, and hornbeam.

The following profile of Lantz silt loam was observed in a pasture just off Emmitsburg Road (United States Highway No. 15), one-fourth of a mile south of its intersection with Motters Station Road.

Surface soil—

A_p 0 to 6 inches, very dark grayish-brown (2.5Y 3/2), highly organic silt loam; weak, very coarse, crumb structure; hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots plentiful; compact and rather slowly permeable; a few visible pores; contains a few rounded cobblestones of metabasalt or sandstone; medium acid; clear smooth boundary; 4 to 7 inches thick .

A_{2g} 6 to 9 inches, dark olive-gray (5Y 3/2) silt loam that has common, distinct, small and medium mottles of light gray and rusty brown; weak, coarse, crumb structure; hard to very hard when dry, friable when moist, and plastic and sticky when wet; roots rather plentiful; many fine but few larger pores; contains a few cobblestones; medium acid; clear smooth to wavy boundary; 2 to 6 inches thick.

Subsoil—

B_{2g} 9 to 22 inches, olive-gray (5Y 5/2) silty clay loam to clay loam that has common, distinct, medium mottles of yellow and rusty brown; weak, fine to medium, subangular blocky structure; extremely hard when dry, moderately firm and brittle when moist, and plastic and sticky when wet; very few roots; many very small but few larger pores; contains a few cobblestones; medium acid; gradual wavy boundary; 15 to 20 inches thick.

BG 22 to 36 inches, gritty cobbly clay loam, evenly marked with medium and coarse mottles and splotches of gray and brownish yellow (5Y 5/1 and 10YR 6/6); weak, coarse, irregular blocky structure, somewhat flattened, to weak, platy structure; extremely hard when dry, very firm when moist, and sticky and very plastic when wet; practically no roots; no visible pores; medium acid; clear to abrupt irregular boundary; 15 or more inches thick.

Substratum—

C 36 inches +, partly disintegrated greenstone schist grading with depth to hard greenstone.

Not all areas of the Lantz soils have a surface soil as dark as the one described here. The soil varies considerably in thickness, and some areas are very stony. In some places the underlying rock is sandstone or, more commonly, a mixture of sandstone and greenstone.

Lantz silt loam, 0 to 8 percent slopes (LaB).—This soil has a profile like that described. There are 14 acres included that have slopes of a little more than 8 percent, but this is of little significance. All of the Lantz silt loam is in capability unit Vw–2.

Lantz very stony loam, 0 to 15 percent slopes (LbC).—This soil is like the silt loam described for the series, except that it is very stony. It cannot be plowed, and it is not of much use even for pasture. It is in capability unit VIIs–4.

Legore Series

The Legore series consists of rather shallow, well-drained, fine-textured soils that developed from materials weathered from dikes of dark-colored, hard, basic, igneous rocks, chiefly diabase. The soils are associated chiefly with soils of the Montalto, Lehigh, and Penn series. The Montalto soils have parent material like that of the Legore soils, but the Montalto soils are deeper, redder, and more strongly developed in the profile. The Lehigh soils have developed from hard, bluish or purplish, slaty shale called porcelanite, which results when the red shale has been baked or

metamorphosed by the heat and pressure of an intrusion of diabase. The Penn soils have developed from the red shale a little farther from the diabase intrusions, where the shale has been only slightly metamorphosed.

The dikes of diabase on which the Legore soils developed are elevated ridges running generally north and south in the Piedmont Plateau and the red shale areas of the east-central part of Frederick County. A typical ridge of this material is just north of Woodsboro.

The Legore soils are fairly fertile and productive, but most of them are very gravelly or stony, and all of them have such fine texture that they are somewhat hard to manage. Most of these soils, especially in stony areas, are not cultivated. They support a second-growth forest of oaks, maples, hickories, elms, and some dogwoods.

This profile of Legore gravelly silty clay loam was observed in a forest on Legore Bridge Road, one-eighth of a mile south of the Legore Bridge over the Monocacy River.

Surface soil—

A_1 0 to 4 inches, dark-brown (7.5YR 3/2) gravelly silty clay loam; strong, medium, crumb structure; slightly hard when dry, friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and medium and a few larger pores; gravel consists of diabase fragments; slightly acid; clear wavy boundary; 2 to 5 inches thick.

Subsoil—

B_{21} 4 to 10 inches, brown (7.5YR 4/2) gravelly silty clay loam; moderate, fine, subangular blocky structure; hard when dry, friable to firm when moist, and sticky and very plastic when wet; roots plentiful; many fine and medium pores; a few grayish silt coatings on structural surfaces; medium acid; gradual wavy boundary; 4 to 6 inches thick.

B_{22} 10 to 26 inches, brown (7.5YR 4/4) gravelly very heavy silty clay loam; strong, coarse, subangular blocky structure; very hard when dry, very firm when moist, and very plastic and very sticky when wet; very few roots; common fine pores but few larger pores; some gray silt coatings and nearly continuous reddish-brown clayskins; medium acid; gradual wavy boundary; 10 to 24 inches thick.

Substratum—

C 26 to 66 inches, yellowish-brown (10YR 5/6) silty clay loam consisting chiefly of soft, decomposed diabase and finely mottled with yellow and gray; weak laminar structure; slightly hard to very hard when dry, friable to firm when moist, and plastic and sticky when wet; no visible roots; moderately to slowly permeable; contains common, thin, black specks of manganese; medium acid; abrupt broken boundary; 30 or more inches thick.

D_r 66 inches +, hard, undecomposed diabase.

The laminar structure in the substratum has been inherited from the parent rock. The soil itself ranges from 12 to 30 inches in depth over decomposing rock. Most of it is a little shallower than the 26-inch depth of the profile described. In some places the subsoil is a little more red than the one described.

Legore gravelly silty clay loam, 0 to 15 percent slopes, moderately eroded (LcB2).—The profile of this soil is described under the series. This soil is in capability unit IIIe–30.

Legore gravelly silty clay loam, 15 to 25 percent slopes, moderately eroded (LcD2).—These stronger slopes should not be cultivated because of the erosion hazard. They can be pastured with care. This soil is in capability unit VIe–3. Ten acres are severely eroded.

Legore silty clay loam, 0 to 15 percent slopes, moderately eroded (LdB2).—This soil has a profile like that described, except that it contains little gravel or stone. Included are 4 acres that have slopes of slightly more than 15 percent. This soil is in capability unit IIIe–30.

Legore very stony clay loam, 0 to 15 percent slopes (LeB).—The profile of this soil is even finer in surface texture than the profile described for the series. In addition, it is so stony that cultivation is almost impossible. It can be safely pastured, however, or left in forest. It is in capability unit VIs–2.

Legore very stony clay loam, 15 to 50 percent slopes (LeE).—These steeper areas should remain in forest. This soil is in capability unit VIIs–3.

Lehigh Series

The Lehigh series consists of somewhat poorly drained to moderately well drained, rather shallow soils. They developed on materials that weathered from porcelanite, or partly baked and metamorphosed bluish-gray, greenish-gray, or purplish shales of Triassic age. They are associated chiefly with the Legore soils that developed on the diabase ridges and with the Penn soils that developed on the shales that were little altered by the intrusion of the diabase.

The Lehigh soils have only low to moderate fertility. Rainfall runs off quickly instead of percolating downward through the tough, slowly permeable subsoil. The soils are alternately very wet and very dry, and their moisture-supplying capacity is moderately low. They erode very readily. However, under careful management they can be fairly productive. They are used for crops and pasture.

The following profile of Lehigh slaty loam was taken on Harney Road, eight-tenths of a mile west of its intersection with Shriver Road.

Surface soil—

A_p 0 to 7 inches, grayish-brown (2.5Y 5/2) slaty loam to slaty light silt loam; weak, fine, crumb structure; moderately hard when dry, friable when moist, and plastic and very sticky when wet; roots abundant; numerous small and medium pores; strongly acid; clear smooth boundary; 5 to 7 inches thick.

Subsoil—

B_{21} 7 to 11 inches, olive-gray (5Y 4/2) slaty silty clay loam; moderate, medium, crumb structure; moderately hard when dry, firm but brittle when moist, and very plastic and very sticky when wet; few roots; many fine and medium pores; strongly acid; gradual smooth boundary; 3 to 6 inches thick.

B_{22t} 11 to 24 inches, olive-gray clay that has common, distinct, rust-brown and bluish-gray mottles; strong, medium, subangular blocky structure, flattened to somewhat laminated; very hard when dry, very firm when moist, and very plastic and very sticky when wet; practically no roots; many fine but few larger pores; this is a claypan horizon; contains many slaty chips of partly decomposed bluish porcelanite, particularly in lower part; very strongly acid; clear wavy boundary; 10 to 24 inches thick.

Substratum—
C 24 to 48 inches, olive-gray heavy clayey porcelanite that has common, distinct, rust-brown and bluish-gray mottles, as well as some gray mottles and intense blue mottles; structure like that of original slate; very hard when dry, and very firm when moist or wet; no roots; slowly to very slowly permeable; neutral; gradual irregular boundary; 24 or more inches thick.
D_r 48 inches +, hard bluish-gray and greenish-gray porcelanite.

In addition to porcelanite, fragments of diabase from nearby dikes may be on or in the soil. A few small areas contain very little slate in the surface layers.

Lehigh slaty loam, 3 to 15 percent slopes, moderately eroded (LgC2).—This is the most extensive Lehigh soil in the county. The profile is like that described under the series. The soil is in capability unit IIIe–13.

Lehigh slaty silty clay loam, 3 to 15 percent slopes, very severely eroded (LhC4).—This soil has been severely eroded through long use and not-too-careful management. Most of the loamy surface layer has been lost. The present plow layer contains enough of the fine-textured subsoil to make it of silty clay loam texture. The soil has been so badly damaged that it is no longer suited to cultivation and is poorly suited to pasture. It probably should be reserved for forest or other permanent protective vegetation. It is in capability unit VIIs–3.

Lindside Series

The Lindside series consists of moderately well drained soils of flood plains and upland depressions. They developed from fairly recently deposited fine materials washed chiefly from such soils as the Duffield, Hagerstown, and Frankstown, which were derived from limestone. Most of the Lindside soils are on flood plains. Many small areas are on material accumulated by gravity and local washing action on foot slopes.

These soils are fairly fertile. Those on the flood plains are very wet and are flooded fairly frequently. Where the surface drainage is adequate, or where it can be readily established and maintained, these soils are fair for crops and better for improved pasture.

The following profile of Lindside silt loam is in a pasture on Water Street Road, two-tenths of a mile north of its intersection with Stauffer Road.

Surface soil—
A 0 to 14 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure; moderately hard when dry, friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and medium pores; slightly acid; gradual smooth boundary; 10 to 16 inches thick.
Subsoil—
B_1 14 to 30 inches, grayish-brown (10YR 5/2) silt loam that has numerous, weak, fine mottles of gray and a few mottles of rusty brown; weak, medium, crumb structure; moderately hard when dry, moderately firm when moist, and plastic and slightly sticky when wet; roots few; many fine and medium pores; slightly acid; gradual smooth boundary; 15 to 25 inches thick.
B_{2g} 30 to 44 inches, olive (5Y 5/3) silt loam that has numerous, medium, distinct mottles of reddish brown and light gray; weak, thick, platy structure; very hard when dry, firm when moist, and plastic and very sticky when wet; very few roots; many fine but few larger pores; neutral; abrupt smooth boundary; 10 to 30 inches thick.
Substratum—
D_g 44 inches +, strong medium-blue and greenish-blue clay to sandy clay strongly mottled with olive and dark olive (5Y 4/4 and 3/3); the bluish and greenish colors fade on exposure to air; and when dry, the material is light olive-gray (5Y 6/2); weak, coarse, blocky structure; hard when dry, firm when moist, and very plastic and very sticky when wet; no roots; slowly permeable; no visible pores; constantly saturated or waterlogged; neutral; 12 or more inches thick.

In some places the blue horizon is absent or is too deep to be examined easily. These blue and green colors are not included in the standard soil-color charts. The subsoil may be silty clay loam or clay loam in some places. In some areas a few pieces of fine gravel consisting of chert, limestone, or shale are in the upper three horizons. They are more common in the local alluvium phases of this soil series. The B_{2g} horizon, or the D_g when present, may contain considerable waterworn gravel. In many places the soil is underlain by thick deposits of rounded gravel.

Lindside silt loam, 0 to 3 percent slopes (LkA).—This soil has a profile like that described under the series. It lies on stream flood plains. Most areas are small and lie along smaller streams, but a few fairly large areas occur in the flood plains of the Potomac and Monocacy Rivers. A few areas have thin deposits of sand left on the surface by floods. The soil is in capability unit Vw–1.

Lindside silt loam, local alluvium, 0 to 3 percent slopes (LmA).—The small areas of this soil are scattered throughout areas of soils developed from limestone. They lie along small drainageways that are without channels, in a few upland depressions, and in local foot-slope deposits. This soil has much better surface drainage than the silt loam of the flood plains, and it is seldom or never flooded. This makes it better suited to crops, even though it is not well drained internally. It is in capability unit IIw–2.

Lindside silt loam, local alluvium, 3 to 8 percent slopes (LmB).—This soil occurs on foot slopes. The erosion hazard is more of a problem than the impeded drainage of the soil. Small spots of this soil occur wherever limestone soils are found. This soil is in capability unit IIe–14.

Linganore Series

The Linganore series consists of shallow, excessively drained, immature, or skeletal, soils that developed on materials weathered from gray, blue, purplish, or almost black, hard, slaty schist or phyllite. They are not highly productive. Fertility is fairly low, and the soils are droughty because of their shallowness and their large content of rock fragments. In seasons when rainfall is poorly distributed or is less than normal, poor crops are produced.

These soils are very extensive in the eastern and southeastern parts of the county. Small to fairly large areas are widely scattered on slaty ridges throughout the Piedmont area. About 80 percent of the area is

used for general crops, hay, and pasture. About 20 percent is still in hardwood forest consisting mostly of oaks.

The following profile of Linganore channery loam was observed under a forest on Clemsonville Road, one-half mile north of its intersection with Liberty Road at Unionville.

Surface soil—

A_1 0 to 2 inches, very dark gray (10YR 3/1) very channery silt loam; moderate, medium, crumb structure to moderate, very fine, subangular blocky structure; moderately hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many fine and some larger pores; neutral; abrupt wavy boundary; 1 to 4 inches thick.

A_2 2 to 7 inches, dark-gray (10YR 4/1) very channery silt loam; weak, fine, crumb structure to weak, medium, granular structure; hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and medium pores; when pulverized dry, material has a floury consistence; slightly acid; clear wavy to irregular boundary; 4 to 7 inches thick.

Subsoil—

BC 7 to 18 inches, brown (10YR 5/3) very channery silty clay; moderate, medium to coarse, subangular blocky structure; very hard when dry, firm when moist, and plastic and very sticky when wet; roots few; many fine but few larger pores; contains a large number of soft to hard slate fragments; slightly acid; gradual irregular boundary; 8 to 20 inches thick.

Substratum—

C 18 to 33 inches, gray, dark-gray, and brownish-gray clayey, decomposed slaty schist; strong, medium, platy structure; very few roots; moderately rapidly permeable; contains much hard schist; medium acid; abrupt irregular to broken boundary; 10 to 40 inches thick.

D_r 33 inches +, hard, dark-gray slaty schist.

In many places the soil profile is even less deep than the one described. In some places hard bedrock is only a few inches below the surface, and there are a few outcrops of slaty schist. In many eroded areas the surface soil is a mass of slate chips with little fine soil material. In freshly cultivated areas the surface is a dark gunmetal-gray when moist or steel-gray when dry, but it is browner where much of the subsoil has been plowed up into the surface layer. In a few places the soil is deeper.

All areas contain some chunks of hard slaty schist, and residual quartzite impurities are common in many places. Some areas are merely channery and others are both channery and gravelly. The two kinds of soil are difficult to separate; they have the same capabilities; and they require the same management; therefore, they have been mapped in the same units.

Linganore channery and gravelly loams, 0 to 15 percent slopes, moderately eroded (LnB2).—These soils are in capability unit IIIe–40.

Linganore channery and gravelly loams, 15 to 25 percent slopes, moderately eroded (LnD2).—Slopes are strong, but erosion has not been severe. These soils are in capability unit IVe–10.

Linganore channery and gravelly silt loams, 3 to 15 percent slopes, severely eroded (LoB3).—Erosion has removed most of the surface layer of these soils. The present surface is thus finer in texture than that in uneroded or moderately eroded areas. Slopes are not very great, but erosion has been severe enough to limit safe use for cultivated crops. These soils are in capability unit IVe–10.

Linganore channery and gravelly silt loams, 15 to 25 percent slopes, severely and very severely eroded (LoD3).—Erosion has been so severe on these soils that they are of no use for crops and cannot be pastured safely. These soils should be reforested. They are in capability unit VIIe–3.

Linganore channery and gravelly silt loams, 25 to 55 percent slopes, severely eroded (LoE3).—These soils are nearly all very seriously eroded. They are too steep and too thin for any use except forestry. These soils are in capability unit VIIe–3.

Linganore very stony loam, 3 to 55 percent slopes (LpC).—This soil has a profile like that described for the series, but it is very stony. It has many stones and boulders of massive slate and some outcropping ledges of the same material. Most of it is also steep, and some of it is eroded. It is of little use except for forestry. It is in capability unit VIIs–2.

Made Land

Some areas have been so changed by human activities that they can no longer be identified by any soil type or series. Such areas have no agricultural use.

Made land (MtA).—The largest area of Made land in Frederick County is in the railroad yards at Brunswick, where the surface soil has all been removed and the land ballasted with gravel and cinders. There are smaller areas elsewhere. None of these are in any capability unit.

Manor Series

The Manor soils are shallow to very shallow, more or less skeletal and immature, and somewhat excessively drained. They are developing from materials weathered from thin, platy schistose rocks that in most places contain a great deal of mica. The Manor soils are not very fertile or productive. They are very droughty in seasons when rainfall is less than normal. They erode very easily if they are not carefully managed.

This is the most extensive soil series in Frederick County, and it dominates in the agriculture of that part of the uplands within the Piedmont Plateau area. The Manor soils are associated with many other soils from similar materials, such as the Glenelg, Chester, Elioak, Linganore, Urbana, and Glenville soils.

Little of the Manor series is cultivated for crops. Considerable areas are in pasture or forest. The forest is chiefly oaks, but it also contains many hickory, locust, horsechestnut, dogwood, and other trees. In the southern part of the county, shortleaf pine and Virginia pine are reforesting fields that were formerly cultivated.

The following description of Manor channery loam was taken in a forest on Simpsons Mill Road, one-

fourth of a mile north of its intersection with Green Valley Road, about 5 miles north of Libertytown.

Surface soil—

A_1 0 to 1 inch, very dark gray (10YR 3/1) channery loam; weak, fine to medium, granular structure; soft when dry, very friable when moist, and nonplastic and nonsticky when wet; roots plentiful; many pores of all sizes; contains fragments of mica-schist; medium acid; abrupt wavy boundary; 1 to 2 inches thick.

A_2 1 to 4 inches, yellow (10YR 7/6) channery loam to channery light silt loam; weak, fine, crumb structure; slightly hard when dry, friable when moist, and sticky and slightly plastic when wet; roots plentiful; many pores of all sizes; very strongly acid; clear wavy boundary; 2 to 5 inches thick.

Subsoil—

BC 4 to 18 inches, yellowish-brown (10YR 5/6) extremely channery silt loam; strong, medium, crumb structure to strong, very fine, subangular blocky structure; slightly hard when dry, friable when moist, and plastic and sticky when wet; few roots; many pores of all sizes; consists of 70 to 80 percent fragments of schist and 20 to 30 percent fine subsoil material; strongly acid; gradual irregular boundary; 5 to 15 inches thick.

Substratum—

C 18 to 36 inches +, brownish-yellow (10YR 6/6) fragments of mica-schist, slightly decomposed, with some fine material; very strongly acid.

The soil varies somewhat in color. Some areas are more reddish than the one described, and some areas have a slightly olive cast inherited from the parent material. Where plowed, the surface soil is yellow to yellowish brown or, in some places, reddish yellow. In many eroded or severely eroded areas, there is little surface soil or subsoil left. The plow layer is in the parent materials from which the Manor soils normally develop.

Some areas of Manor soils contain gravel derived from the white quartzite impurities in the mica-schist parent material. In some places the soils contain large chunks or blocks of mica-schist. Gravelly areas were not separated on the soil map, because they require the same kind of management as the other Manor soils. All Manor soils except the very stony ones were mapped as channery and gravelly loams.

Manor channery and gravelly loams, 0 to 8 percent slopes, moderately eroded (MaB2).—These are very extensive soils throughout the eastern and southeastern parts of the county. They are in capability unit IIe–10. Included are 72 acres that are more severely eroded. They should be treated as if in capability unit IIIe–10.

Manor channery and gravelly loams, 8 to 15 percent slopes, moderately eroded (MaC2).—This is the most extensive mapping unit in Frederick County. Erosion is only moderate, but the strong slopes make it necessary to place these soils in capability unit IIIe–10. About two-thirds of the area is cultivated at least part of the time. Some is still in forest, and a large area is in pasture. Special management practices are necessary to keep these soils fairly productive under cultivation.

Manor channery and gravelly loams, 8 to 15 percent slopes, severely eroded (MaC3).—These soils must be managed very carefully for safe cultivation. Sheet erosion is severe, and there are many shallow and a few deep gullies. Most of the areas are in capability unit IVe–10. They should be put into permanent pasture, but they can be cultivated safely on a limited basis if special care is taken. Included are 98 acres so very severely eroded that permanent cover is necessary to protect them. These 98 acres should be managed as if they were in capability unit VIe–3.

Manor channery and gravelly loams, 15 to 25 percent slopes, moderately eroded (MaD2).—Less than half of the area of these soils is in cultivation. A large part is in forest, and there is considerable pasture. If properly managed, these soils are suitable for pasture and part-time or limited cultivation. They should never be cultivated intensively, because of the dangers of soil loss. They are in capability unit IVe–10.

Manor channery and gravelly loams, 15 to 25 percent slopes, severely eroded (MaD3).—These soils should never be used for cultivated crops. In most places they could still support permanent pasture if well managed. These soils are in capability unit VIe–3.

Manor channery and gravelly loams, 15 to 25 percent slopes, very severely eroded (MaD4).—These soils should be fenced, planted to trees, and carefully protected. They are in capability unit VIIe–3.

Manor channery and gravelly loams, 25 to 45 percent slopes, moderately eroded (MaE2).—These soils are too steep for safe cultivation, but they could be used as permanent pasture if carefully managed. They are in capability unit VIe–3.

Manor channery and gravelly loams, 25 to 55 percent slopes, severely and very severely eroded (MaE3).—These soils are too eroded for safe cultivation or grazing. Probably the best use would be forestry. Most areas would need planting to desirable trees, fencing, and careful protection against fires and grazing. These soils are in capability unit VIIe–3.

Manor very stony loam, 3 to 15 percent slopes (MbC).—This Manor soil, in addition to being channery or gravelly, has numerous outcrops of hard slaty schist, or loose stones of the same material, or both. Many areas also have stones and boulders that are mostly white quartzite. Because of the stoniness the soil is in capability unit VIs–2.

Manor very stony loam, 15 to 55 percent slopes (MbE).—These soils are generally somewhat more eroded than Manor very stony loam, 3 to 15 percent slopes. Because of steepness, stoniness, and susceptibility to further erosion, they are in capability unit VIIs–3. They should be used only as woodland.

Melvin Series

The Melvin series consists of poorly drained soils of the recent alluvial flood plains and of some upland depressions. They developed from materials washed in from areas of limestone soils such as the Duffield, Frankstown, or Hagerstown. The Melvin soils are quite fertile, but they are sometimes very wet. Both internal drainage and runoff are very slow.

The Melvin soils lie on the bottoms or flood plains, where they are associated chiefly with the well-drained Huntington soils and the moderately well drained Lindside soils derived from similar materials. A few small, scattered spots that are even more poorly

drained than Melvin soils belong to the Dunning series, but are included as wet spots within the Melvin series. No Dunning soils were mapped separately in Frederick County.

If artificial drainage were installed and controlled, the Melvin soils could be used for corn and hay. Most of the areas, however, are pastured or left to grow up to brush and weeds.

The following profile of Melvin silt loam is in a pasture on Lilypons Road, two-tenths of a mile east of its intersection with Buckeystown Road (United States Highway No. 15).

Surface soil—
- A_p 0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, coarse, crumb structure; very hard when dry, friable when moist, and plastic and sticky when wet; roots abundant; many fine and medium pores; neutral; clear smooth boundary; 4 to 6 inches thick.

Subsoil—
- B_{1g} 4 to 30 inches, olive (5Y 5/3) heavy silt loam to silty clay loam that has numerous, distinct, fine specks or mottles of rusty brown and light gray; compound weak, medium to thick, platy structure and moderate, fine, subangular blocky structure; extremely hard when dry, firm when moist, and very plastic and very sticky when wet; roots plentiful in upper 4 inches, few in lower part; many fine and a very few medium pores; slightly acid; abrupt smooth boundary; 20 to 30 inches thick.

Substratum—
- G_1 30 to 33 inches, dark-gray to purplish-gray clay that has a few, medium, distinct mottles of yellow, red, and brown; extremely hard when dry, firm when moist, and very plastic and very sticky when wet; practically no roots; no visible pores; mildly alkaline; abrupt smooth boundary; 2 to 5 inches thick.
- G_2 33 to 48 inches +, dark-gray to purplish-gray clay that has a few, medium, distinct mottles of yellow, red, and brown; extremely hard when dry, firm when moist, and very plastic and very sticky when wet; practically no roots; no visible pores; mildly alkaline; contains a large number of fine, water-worn chert pebbles.

Not all areas have the purplish color in the substratum. Some areas have a thin sandy mantle of recent overwash material.

Melvin silt loam, 0 to 3 percent slopes (McA).—All of the Melvin soil in Frederick County is in this mapping unit. The profile is described under the series. The soil is scattered in small areas throughout the limestone valley. It is in capability unit IIIw–1.

Montalto Series

The Montalto soils are deep, well drained, and fine textured. They developed on materials weathered from dark-colored, hard, basic, igneous rocks, in this county chiefly diabase. They are fertile and productive, but most of them are very stony, and some areas are very steep. The fine texture is difficult to handle except at just the right moisture content. The soils puddle easily when too wet, and they dry to very hard clods.

These soils occur on uplands within the Piedmont Plateau, mostly in the northeastern part of the county near the Pennsylvania line. They are sometimes associated with the Legore soils, and they are very similar, except that the Montalto soils are much deeper, are more red in color, and have a more strongly developed profile.

Montalto soils that are neither too stony nor too steep are used for crops and pasture. Most of the stony areas are still in a forest of hardwoods dominated by oaks.

The profile of Montalto silty clay loam that follows was observed in a pasture just off Water Street Road, three-tenths of a mile south of its intersection with the Liberty-Daysville Road.

Surface soil—
- A_p 0 to 6 inches, dark reddish-brown (5YR 3/3) silty clay loam; moderate, coarse, crumb structure; slightly hard when dry, very friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and medium pores; slightly acid; clear smooth boundary; 4 to 7 inches thick.

Subsoil—
- B_1 6 to 10 inches, dark-brown (7.5YR 4/2) silty clay loam; moderate, medium, subangular blocky structure; moderately hard when dry, friable when moist, and plastic and sticky when wet; roots rather plentiful; many fine and medium pores; neutral; gradual wavy boundary; 3 to 5 inches thick.
- B_{21} 10 to 30 inches, dark reddish-brown (5YR 3/4) heavy silty clay loam; strong, medium, subangular blocky structure; hard when dry, firm when moist, and plastic and sticky when wet; few roots; many fine but few larger pores; strongly acid; gradual wavy boundary; 12 to 24 inches thick.
- B_{22} 30 to 50 inches, dark reddish-brown or dark-red (5YR 3/4 or 2.5YR 3/6) silty clay or clay; strong, medium, subangular blocky structure; structural surfaces strongly coated with films of black manganese; very hard when dry, very firm when moist, and very plastic and very sticky when wet; very few roots; many fine but few larger pores; slightly acid; gradual wavy to irregular boundary; 15 to 28 inches thick.

Substratum—
- C_1 50 to 64 inches, yellowish-brown (10YR 5/6) sandy clay loam; structureless; moderately hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; no roots; moderately permeable; contains many fragments of dark-brown, black, and white disintegrated diabase; neutral; gradual wavy to irregular boundary; 6 to 36 inches thick.
- C_2 64 inches +, varicolored, disintegrated, soft diabase.

Some diabase fragments are present throughout all of these soils, but they occur in great quantity only in the stony types. The chief variation is in depth to bedrock. The subsoil may be slightly less or slightly more red in color than described.

Montalto silty clay loam, 0 to 8 percent slopes, moderately eroded (MdB2).—Most of this soil has a profile like the one described, but in a few spots the surface is loam instead of silty clay loam. The soil is in capability unit IIe–4.

Montalto silty clay loam, 8 to 15 percent slopes, moderately eroded (MdC2).—Most of this soil is only moderately eroded, but 9 acres are more severely eroded. The soil is in capability unit IIIe–4.

Montalto silty clay loam, 15 to 25 percent slopes, moderately eroded (MdD2).—This soil is too steep for more than occasional or part-time cultivation, but it is an excellent soil for pasture. Two acres have slopes of more than 25 percent. This soil is in capability unit IVe–3.

Montalto very stony clay loam, 0 to 15 percent slopes,

moderately eroded (MeB2).—This soil has a profile similar to that described under the series, except that it is very stony and has finer texture in the surface layer. It is not suitable for cultivation, but it makes excellent pasture when properly managed. It is in capability unit VIs–2.

Montalto very stony clay loam, 15 to 45 percent slopes (MeD).—This soil is not seriously eroded, but it cannot be cultivated and is of little use for pasture. It is in capability unit VIIs–3.

Myersville Series

The Myersville series consists of deep, well-drained, medium-textured soils that developed on materials weathered from metabasalt, or greenstone. They are excellent soils, important to the agriculture of the county. They are high in fertility and productiveness and rather easy to manage in most areas.

These soils occur mainly on uplands within the Middletown Valley. The Fauquier soils are associated with the Myersville soils.

Nearly all of the Myersville soils, except in the steepest and most stony areas, are in cultivated crops or high-quality pasture. Originally, they supported thick hardwood forests of excellent quality, in which white oak and red oak were dominant. All but a few areas have been cleared for farming.

The following profile of Myersville loam was observed in a cultivated field on Valleyview Road, about 200 yards east of its intersection with the Myersville-Middletown Road.

Surface soil—

A_p 0 to 10 inches, dark yellowish-brown (10YR 4/4) loam; strong, fine, crumb structure; moderately hard when dry, very friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and medium and some larger pores; contains some quartzite gravel; medium acid; gradual smooth boundary; 8 to 10 inches thick.

Subsoil—

B_{21} 10 to 20 inches, dark-brown (7.5YR 4/4) silt loam; strong, medium, subangular, blocky structure; hard when dry, moderately firm when moist, and plastic and sticky when wet; roots plentiful; many fine and medium pores; contains some white quartzite fragments; medium acid; gradual wavy boundary; 8 to 12 inches thick.

B_{22} 20 to 29 inches, dark-brown (7.5YR 4/4) silty clay loam; strong to very strong, medium, subangular blocky structure; very hard when dry, firm when moist, and plastic and sticky when wet; roots rather few; many fine and some medium pores; medium acid; gradual irregular boundary; 8 to 15 inches thick.

B_3 29 to 40 inches, yellowish-red (5YR 4/6) silty clay loam; strong, medium to coarse, subangular blocky structure; very hard when dry, very firm when moist, and sticky and very plastic when wet; no roots; many fine and medium pores; contains many fragments of soft schist; cut surface appears mottled because of the yellowish schist fragments it contains; medium acid; gradual very irregular boundary; 10 to 30 inches thick.

Substratum—

C 40 to 48 inches +, mottled olive, greenish, brownish-yellow, and brown decomposed schist; very firm; strongly acid; grades at 6 feet or more into hard greenstone.

The amount of quartzite gravel in the Myersville soils varies considerably. Some very stony areas have boulders and outcrops of greenstone.

The Myersville soils are dominant wherever they occur in the county, but the Fauquier soils are so intricately associated with them that the two series were mapped in the same units. The Fauquier soils are similar to the Myersville soils, but more intensely red. A typical profile of Fauquier loam is described under the Fauquier series. The Myersville soils vary somewhat in color, and where they are somewhat redder than normal, it is difficult to distinguish them from the Fauquier soils. The Fauquier soils are slightly heavier and more strongly developed in the subsoil.

Myersville and Fauquier clay loams, °15 to 25 percent slopes, very severely eroded (MgD4).—These soils have been so severely eroded that they have a heavy clay loam plow layer, made up entirely of former subsoil material. They cannot be safely cultivated. If they are grazed, there is great danger of further erosion. Small areas should be reserved for woodlots, and larger areas probably should be reforested. The soils are in capability unit VIIs–3.

Myersville and Fauquier gravelly loams, 0 to 3 percent slopes (MhA).—The profiles of these soils differ from the profiles of the Myersville loam and the Fauquier loam only in that they contain 15 percent or more of angular quartzite gravel, particularly in the surface layer. These soils are all in cultivation or in farmyards. They are excellent soils, in capability unit I–4.

Myersville and Fauquier gravelly loams, 3 to 8 percent slopes, moderately eroded (MhB2).—These soils are practically all cultivated. They are likely to erode, and, therefore, they need careful management. They are in capability unit IIe–4.

Myersville and Fauquier gravelly loams, 8 to 15 percent slopes, moderately eroded (MhC2).—These soils are subject to erosion. They are in capability unit IIIe–4.

Myersville and Fauquier loams, 0 to 3 percent slopes (MkA).—The Myersville soil in this unit has a profile like that described under the series. A profile like that of the Fauquier soil is described under the Fauquier series. In some places the soil is a gradation between the two series. Some areas have lost a little surface soil and contain a few small gullies, but this erosion is not typical. These soils are easily managed. They are in capability unit I–4.

Myersville and Fauquier loams, 3 to 8 percent slopes, moderately eroded (MkB2).—These soils are almost entirely under cultivation or in high-grade pasture. They are the most extensive soils in the Middletown Valley. Because they need continued careful management, these soils are in capability unit IIe–4. The 103 acres that are more severely eroded are indicated on the soil map by symbols; they should be given more careful treatment and management, such as that suggested for soils of capability unit IIIe–4.

Myersville and Fauquier loams, 8 to 15 percent slopes, moderately eroded (MkC2).—Careful management is necessary on these soils, since nearly all of their acreage is cultivated. These soils are in capability unit IIIe–4.

Myersville and Fauquier loams, 15 to 25 percent slopes, moderately eroded (MkD2).—Most of this unit is in crops. These soils can remain in crops if they are carefully managed. Long rotations that include considerable periods of hay or other close-growing crops are necessary, and water should be disposed of very carefully. These soils are in capability unit IVe–3. The 62 acres that are somewhat gravelly are shown on the map by gravel symbols.

Myersville and Fauquier loams, 25 to 45 percent slopes, moderately eroded (MkE2).—Most of this unit is in well-managed pasture or woodlots, and all of it should be. Because of their susceptibility to erosion, these soils are in capability unit VIe–2.

Myersville and Fauquier loams, 25 to 50 percent slopes, severely eroded (MkE3).—These soils are in capability unit VIIs–3. Cultivation should not be attempted. These soils should be in permanent forest.

Myersville and Fauquier silt loams, 0 to 3 percent slopes (MmA).—The profiles of the soils in this unit are similar to the profiles described for Myersville loam and Fauquier loam, except that the surface soil has a much finer texture and contains more silt and much less sand. All of this excellent land is in cultivation. It is easily managed and maintained. These soils are in capability unit I–4.

Myersville and Fauquier silt loams, 3 to 8 percent slopes, moderately eroded (MmB2).—This unit is fairly extensive, and nearly all of it is in cultivation. It is in capability unit IIe–4. The map shows 37 acres that are more severely eroded and need more careful management. These areas should be treated as if they were in capability unit IIIe–4.

Myersville and Fauquier silt loams, 8 to 15 percent slopes, moderately eroded (MmC2).—There is a large area of this mapping unit. Nearly all of it has been in cultivation, but good management has prevented severe erosion. There is enough erosion hazard to make careful management necessary. The soils are in capability unit IIIe–4.

Myersville and Fauquier silt loams, 15 to 25 percent slopes, moderately eroded (MmD2).—Most of this unit is or has been in cultivation. The soils are a little less deep than similar soils on more level areas, but they are like them otherwise. The rather strong slopes do limit capability, however, so these soils are placed in capability unit IVe–3. To prevent damaging erosion, these soils should be cultivated on a very limited basis only. They should be kept in pasture or other close-growing vegetation most of the time.

Myersville and Fauquier silty clay loams, 8 to 15 percent slopes, severely eroded (MnC3).—These soils were probably once loams and silt loams, but the loamy surface soils have been almost entirely lost through erosion. The present surface soils are made up mostly of the former silty clay loam subsoils, which have been plowed and cultivated. If cultivation is continued, further erosion will result. These soils probably should be kept in permanent vegetation, such as permanent pasture. They are in capability unit VIe–2.

Myersville and Fauquier very stony loams, 3 to 35 percent slopes (MoC).—These soils have a profile like the one described for Myersville loam and Fauquier loam, except that cultivation is discouraged or prohibited by the stones and boulders on and within the soil and by outcrops of hard rock. These soils vary considerably in depth, but on the average they are much shallower than the loams or silt loams. They are suitable for controlled grazing if properly managed. Steepness and stoniness place these soils in capability unit VIIs–3.

Myersville and Fauquier very stony loams, 35 to 50 percent slopes (MoE).—These steep, very stony loams are likely to erode, and stoniness limits their use. They are in capability unit VIIs–3. Most areas are now in forests or woodlots, and all of them should be.

Norton Series

The Norton series consists of well-drained, deep to very deep, well-developed soils. Their parent material is old rockslide or colluvial debris mixed with red shales of the valleys. The colluvial material is mostly greenstone, but it contains some quartzite and sandstone and a little chert. As these materials rolled and washed out over the red shales of the valleys, considerable shale material became mixed with the colluvium.

These soils are located at the outer edges of the colluvial foot slopes around Catoctin Mountain. They are associated with the Braddock soils, which developed on the colluvial material, and with the Penn soils, which developed on the red shales.

The Norton soils are fairly fertile and productive. They have a moderate to fairly high moisture-supplying capacity. They seem more productive than the Penn soils. They are not so productive as the Braddock soils, but they contain less gravel and cobblestones, are easier to manage, occur on longer and smoother slopes, and are suitable for a wider range of crops.

The following profile of Norton gravelly silt loam was observed in a cultivated area at the intersection of Old Lime Kiln Road and Orndorff Road.

Surface soil—

A_p 0 to 8 inches, dark reddish-brown (5YR 3/4) gritty, gravelly silt loam; moderate, fine, crumb structure; moderately hard when dry, very friable when moist, and slightly plastic but nonsticky when wet; roots abundant; many fine and medium pores; gravel and grit consists mainly of quartzite, with some metabasalt; medium acid; clear smooth boundary; 5 to 8 inches thick.

A_2 8 to 15 inches, reddish-brown (5YR 4/4) gritty, gravelly silt loam; moderate to strong, fine, crumb structure; moderately hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots plentiful; many fine and medium pores; strongly acid; clear wavy boundary; 5 to 8 inches thick.

Subsoil—

B_{21} 15 to 31 inches, red (2.5YR 4/6) gritty, gravelly silty clay loam; moderate, medium, subangular blocky structure; very hard when dry, friable when moist, and plastic and sticky when wet; roots few; many fine and some medium pores; strongly acid; gradual wavy boundary; 12 to 18 inches thick.

B_{22} 31 to 48 inches, red (2.5YR 4/8), gritty silty clay loam; compound weak, platy structure and strong, fine, subangular blocky structure; very hard when dry, moderately firm when moist, and plastic and

sticky when wet; roots very few; many fine and some medium pores; strongly acid; gradual irregular boundary; 16 to 20 inches thick.

B_3 48 to 58 inches, dark-red (2.5YR 3/6), slightly gritty, very gravelly heavy silt loam; compound weak, thick, platy structure and weak, fine, subangular blocky structure; very hard when dry, moderately firm when moist, and slightly plastic and slightly sticky when wet; no visible roots; many fine and very fine and some medium pores; very strongly acid; gradual irregular boundary; 6 to 10 inches thick.

Substratum—

C 58 inches +, reddish-brown (2.5YR 4/4), very gritty, compact, very gravelly loam to silt loam; weak, very irregular, laminar structure; very hard when dry, firm when moist, and sticky and slightly plastic when wet; no roots; slowly permeable; contains gravel consisting of considerable rather soft shale, some quartzite and metabasalt, and a little sandstone; very strongly acid.

The laminar structure of the C horizon probably was inherited from the shale parent material.

Norton gravelly silt loam, 0 to 3 percent slopes (NoA).—This is a very good agricultural soil. It is in capability unit I–4.

Norton gravelly silt loam, 3 to 8 percent slopes, moderately eroded (NoB2).—This is the most extensive Norton soil in Frederick County. It is in capability unit IIe–4. It includes 21 acres of more severely eroded soil that should be kept under permanent cover.

Norton gravelly silt loam, 8 to 15 percent slopes, moderately eroded (NoC2).—Because these slopes require careful management, this soil is in capability unit IIIe–4. The 9 acres that are very severely eroded should be kept in trees or other permanent vegetation.

Norton gravelly silt loam, 15 to 25 percent slopes, moderately eroded (NoD2).—Cultivation of this soil would be hazardous. Limited cultivation can be practiced under careful management. Pasture would probably be better than cultivated crops. The soil is in capability unit IVe–3.

Norton gravelly silt loam, 25 to 45 percent slopes, moderately eroded (NoE2).—This soil is generally not severely eroded because most of it is still in forest. It could be grazed under careful management. It is in capability unit VIe–2.

Norton very stony loam, 3 to 8 percent slopes (NbB).—In profile this soil is similar to the Norton gravelly silt loam, except that cobblestones, larger stones, and boulders are common throughout the soil and upon the surface. The entire area is still in forest and has never been plowed. If this soil were cleared, it could be safely used for grazing, but it would be difficult to manage because of the stoniness. It is much too stony to be cultivated by modern methods. It is in capability unit VIs–2.

Penn Series

The Penn series consists of well-drained to somewhat excessively drained, moderately shallow to very shallow soils. They developed from purplish-red or dark-red shale and sandstone. These soils are immature and show little profile development.

The Penn soils occur in the valley between Catoctin Mountain to the west and the Piedmont Plateau to the east. They are more extensive than any other soils in the county except the Manor soils of the Piedmont Plateau. The soils associated with the Penn soils are the Readington, Croton, Bucks, Lansdale, Norton, Athol, Chalfont, Bermudian, Rowland, Bowmansville, Birdsboro, and Raritan. Small scattered areas of lighter colored soils that developed from light-colored shale and sandstone probably belong to the Steinsburg series (not mapped separately in this county), but they are included with the Penn soils because they are small and their management is similar to that of the Penn soils.

The soils of the Penn series are important in the economy of Frederick County, although they are generally low in productivity. They are low in fertility, shallow over bedrock, and droughty to very droughty. In many places they are very shaly or gravelly. Under intensive good management, some of them can be fairly productive. They are probably better suited to pasture and hay than to general farm crops. Many small to medium-sized farms located on these soils have reasonably good production.

The following profile of Penn silt loam was observed in a forest on Good Intent Road, one-half mile west of Simpsons Mill Road, in the Friendship community of the northeastern part of the county.

Surface soil—

A_1 0 to 1 inch, dark reddish-brown (5YR 2/2) silt loam; strong, fine, granular structure; soft when dry, loose to very friable when moist, and very slightly plastic and slightly sticky when wet; roots abundant; many pores of all sizes; contains a few, scattered, red shale chips; medium acid; clear smooth boundary; 1 to 2 inches thick.

A_3 1 to 6 inches, reddish-brown (5YR 4/3) silt loam; moderate, fine, granular structure; slightly hard when dry, very friable when moist, and slightly plastic and slightly sticky when wet; roots plentiful; many fine and medium and some larger pores; contains some red shale chips; very strongly acid; clear wavy boundary; 3 to 7 inches thick.

Subsoil—

B_2 6 to 19 inches, reddish-brown (2.5YR 4/4) silty clay loam to shaly silty clay loam; strong, medium, subangular blocky structure; moderately hard when dry, friable when moist, and plastic and very sticky when wet; roots few; many fine and a few larger pores; contains much more shale than horizons above; strongly acid; gradual wavy boundary; 12 to 20 inches thick.

Substratum—

C 19 to 31 inches, weak-red (2.5YR 4/2) partly decomposed shale containing some fine soil material; no roots; strongly acid; clear broken boundary; 12 to 30 inches thick.

D_r 31 inches +, dark reddish-brown hard shale that contains some thin bands of sandstone.

This depth of 19 inches over the substratum is about average for the Penn silt loams. Other Penn soils in this county are shallower.

In many places in the county, particularly near the southern limits of the range of the Penn soils, the surface soil of the Penn loams and the Penn gravelly loams is rather sandy.

Penn gravelly loam, 0 to 8 percent slopes, moderately eroded (PaB2).—This soil has a profile similar to that described under the series, except that it contains a considerable quantity of loose, red sandstone gravel and some fragments of shale. It is not so deep as the

silt loams, but it is deeper than the Penn shaly loams. Good management has prevented more severe erosion. This soil is in capability unit IIe–10.

Penn gravelly loam, 0 to 8 percent slopes, severely eroded (PaB3).—A considerable part of this soil is much less gravelly than is normal for Penn gravelly loam. This soil is in capability unit IIIe–10.

Penn gravelly loam, 8 to 15 percent slopes, moderately eroded (PaC2).—This soil is very likely to erode, but it can be cultivated safely if managed like the soils in capability unit IIIe–10.

Penn gravelly loam, 8 to 15 percent slopes, severely eroded (PaC3).—This soil is suitable only for very limited cultivation with very careful management. Most of it would be safer if used for pasture. This soil is in capability unit IVe–10.

Penn gravelly loam, 15 to 25 percent slopes, moderately eroded (PaD2).—This soil can be cultivated occasionally with great care. It is in capability unit IVe–10.

Penn loam, 0 to 8 percent slopes, moderately eroded (PbB2).—The profile of this soil has a distinctly coarser surface soil than the profile described under the series. This soil is not so deep as the Penn silt loams, but it is deeper than the Penn shaly loams and the Penn gravelly loams. With reasonably good care it can be cultivated with little danger of further erosion damage. It is in capability unit IIe–10.

Penn loam, 8 to 15 percent slopes, moderately eroded (PbC2).—This soil can be cultivated safely if managed as outlined for soils of capability unit IIIe–10.

Penn loam, 8 to 15 percent slopes, severely eroded (PbC3).—Practically all of the surface soil and some of the subsoil has been lost from this soil through erosion. Further cultivation would be very hazardous and should be limited. The soil is in capability unit IVe–10.

Penn loam, 15 to 25 percent slopes, moderately eroded (PbD2).—This soil can be cultivated occasionally if managed with great care. It is in capability unit IVe–10. A few very small areas of silt loam are included.

Penn loam and gravelly loam, 15 to 25 percent slopes, severely eroded (PcD3).—In this mapping unit the loam and gravelly loam have been mapped together. These soils can be grazed if properly managed. They should not be cultivated, because there is extreme hazard of further erosion. In a few spots the soil has a silt loam surface layer. These soils are in capability unit VIe–3.

Penn shaly loam, 0 to 15 percent slopes, moderately eroded (PdB2).—This soil has a very shaly surface layer. It is thinner and droughtier than any of the other Penn soils. It is only 3 to 6 inches deep over loose shale fragments. The soil is extensive, and a large part of its area is in forest. It is in capability unit IIIe–40.

Penn shaly loam, 3 to 15 percent slopes, severely eroded (PdC3).—The severely eroded parts of this soil contain masses of loose shale right to the surface. This soil is generally unsuited to cultivation. It is in capability unit VIe–3.

Penn shaly loam, 15 to 25 percent slopes, moderately eroded (PdD2).—Because of the great hazard of erosion, this soil is generally unsuited to cultivation. It is in capability unit VIe–3.

Penn shaly loam, 15 to 25 percent slopes, severely eroded (PdD3).—This soil has lost practically all of its upper layers by erosion. It now consists mostly of weathered shale mixed with some soil material. It is no longer suited to cultivated crops. It can make fairly good pasture if it is protected from trampling until grass sod is established. Such pasture must be carefully managed and overgrazing especially avoided, or erosion will again strip the surface. This soil could be used for forest. All of it is in capability unit VIe–3.

Penn silt loam, 0 to 8 percent slopes, moderately eroded (PeB2).—The profile of this soil is like that described in detail under the series. This is the most productive of the Penn soils in Frederick County. It is one of the most extensive soils in the county. It is in capability unit IIe–10.

Penn silt loam, 3 to 8 percent slopes, severely eroded (PeB3).—This soil has been eroded enough to limit its use. It is in capability unit IIIe–10.

Penn silt loam, 8 to 15 percent slopes, moderately eroded (PeC2).—This soil is in capability unit IIIe–10.

Penn silt loam, 8 to 15 percent slopes, severely eroded (PeC3).—This soil has had so much erosion damage that it should be very seldom cultivated, and then only with the greatest care. It is in capability unit IVe–10.

Penn soils, 3 to 8 percent slopes, very severely eroded (PgB4).—This unit consists of small scattered areas of any of the Penn soils that have a combination of slope and severe erosion that makes them entirely unsuitable for cultivated crops. The surface soil and subsoil are gone, and the parent material is exposed. Such soils are unsuitable for crops or pasture but may have some value as woodland and for wildlife shelter. The soils are in capability unit VIIe–3.

Penn soils, 8 to 15 percent slopes, very severely eroded (PgC4).—This unit consists of several Penn soils that are too eroded for cultivation. The soils may be of some use for forest. They are in capability unit VIIe–3.

Penn soils, 15 to 25 percent slopes, very severely eroded (PgD4).—Most of the soils in this unit are shaly loams. They should be reserved as woodland, although they will not be very productive of forest products. These soils are in capability unit VIIe–3.

Penn soils, 25 to 50 percent slopes, moderately eroded (PgE2).—These Penn soils can be pastured if proper precautions are taken, but they should not be cultivated. They are in capability unit VIe–3.

Penn soils, 25 to 50 percent slopes, severely eroded (PgE3).—These soils are of no use for crops or pasture, but they would be fairly good as woodland. They are in capability unit VIIe–3.

Penn-Lansdale loams, 0 to 8 percent slopes, moderately eroded (PhB2).—This unit is a complex of Penn loam and Lansdale loam, so intricately associated that it is not practical to separate them. The two soils are similar in every characteristic except color, and the management they need is the same. They are in capability unit IIe–10. There are 12 acres that are more severely eroded, and these areas should be managed like the soils of capability unit IIIe–10.

Penn-Lansdale loams, 8 to 15 percent slopes, moderately eroded (PhC2).—This complex of Penn loam and

Lansdale loam can be cultivated with proper care. It is in capability unit IIIe–10.

Penn-Lansdale loams, 8 to 15 percent slopes, severely eroded (PhC3).—Erosion is so far advanced that these soils are no longer suitable for crops, except on a limited basis and with great care in management. They are in capability unit IVe–10.

Penn-Lansdale loams, 15 to 25 percent slopes, moderately eroded (PhD2).—Because of the steep slopes, cultivation is hazardous and should be done with great care if at all. These soils are in capability unit IVe–10.

Penn-Lansdale loams, 15 to 25 percent slopes, severely eroded (PhD3).—These soils are so severely eroded that cropping should not be attempted. Most of the acreage could be pastured if well managed, but 10 acres are so severely eroded that they should be reserved as woodlots. These soils are in capability unit VIe–3.

Raritan Series

The Raritan series consists of moderately well drained, fairly well developed soils on old alluvial terraces. The material from which the Raritan soils developed was washed from areas of Penn and Readington soils, which were derived from red sandstone and soft red shale. The Raritan soils are not very extensive in this county.

The Raritan soils are fairly fertile. Under good management they can be very productive, but in some seasons they are rather wet and difficult to manage. The B horizon contains a fragipan that impedes the downward movement of water.

The following profile of Raritan silt loam is representative of the series.

Surface soil—

A_p 0 to 6 inches, dark-brown (7.5YR 4/2) silt loam; weak, medium, crumb structure; slightly hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many small and medium and some larger pores; medium acid; clear smooth boundary.

Subsoil—

B_{21} 6 to 16 inches, weak-red (2.5YR 4/2) heavy silt loam; moderate to strong, fine, subangular blocky structure; hard when dry, slightly firm when moist, and plastic and sticky when wet; roots rather plentiful; many fine and some medium pores; strongly acid; gradual wavy boundary.

B_{22m} 16 to 34 inches, light reddish-brown (2.5YR 6/4) silty clay loam that has numerous, fine to medium, distinct mottles of ashy gray and some specks of rusty brown; compound weak, thick, platy structure and strong, somewhat flattened, medium, subangular blocky structure; very hard when dry, firm when moist, and plastic and sticky when wet; roots very few; moderately slowly to slowly permeable; contains a few decomposed shale fragments; this is a fragipan; strongly acid; clear to abrupt wavy boundary.

Substratum—

CD 34 to 42 inches +, weak-red (2.5YR 4/2), firm, stratified loam to silt loam; contains much partly decomposed red shale and some waterworn gravel; strongly acid.

In some places the subsoil is more red or less red than the one described. In most places where it is more red, the depth to mottling is greater. The degree of structural development varies considerably. Some areas are less platy in the lower subsoil and have stronger angular or subangular blocks.

Raritan silt loam, 0 to 3 percent slopes (RaA).—This soil occurs on gentle slopes of terraces, chiefly along the Monocacy River. Its profile is like the one described under the series. The impeded internal drainage causes this soil to be very wet at certain seasons, and this is usually a more important problem than erosion. This soil is in capability unit IIw–1.

Raritan silt loam, 3 to 8 percent slopes, moderately eroded (RaB2).—Runoff from this soil makes erosion common, but in most places it is not severe. Erosion is a greater problem than the impeded internal drainage. The soil is in capability unit IIIe–13.

Readington Series

The Readington series consists of moderately well drained, fairly deep, strongly developed soils derived from material weathered from red shale and sandstone. These soils have a very heavy subsoil or claypan. They are sometimes difficult to plow and cultivate. The surface soil is wet much of the time because drainage through the subsoil is impeded by the heavy texture and plastic consistence. This allows rapid runoff from the sloping areas and in many places leads to erosion that is moderate to rather severe.

The Readington soils occur on nearly level to gently sloping upland flats or in slight depressions throughout the red shale parts of the county. Most areas are rather small; there are very few large, continuous areas.

The Readington soils are closely associated with soils of the Penn series, but they are much less well drained and have a higher moisture-supplying capacity. The Readington soils are more deeply weathered and more strongly developed than the Penn soils. They are usually somewhat more productive, although they are of only moderate fertility.

The following profile of Readington silt loam was sampled in a pasture on Old Lime Kiln Road, three-tenths of a mile east of its intersection with the Emmitsburg Road (United States Highway No. 15).

Surface soil—

A_p 0 to 7 inches, dark-brown (7.5YR 4/4) silt loam; strong, fine, crumb structure; hard when dry, friable when moist, and plastic and sticky when wet; roots abundant; many fine and medium pores; strongly acid; clear smooth boundary; 5 to 7 inches thick.

Subsoil—

B_{21} 7 to 12 inches, reddish-brown (5YR 4/4) silty clay loam; strong, fine, subangular blocky structure; very hard when dry, firm when moist, and very plastic and very sticky when wet; roots rather few; many fine but few larger pores; very strongly acid; gradual wavy boundary; 4 to 8 inches thick.

B_{22} 12 to 28 inches, dark-red (2.5YR 3/6) clay; very strong, fine, subangular blocky structure; very hard when dry, very firm when moist, and very plastic and very sticky when wet; practically no roots; very slowly permeable; very fine pores; very strongly acid; gradual irregular boundary; 12 to 20 inches thick.

B_{23} 28 to 34 inches, yellowish-red (5YR 4/6) clay that has a few large, distinct mottles of gray, dark reddish brown, and black; strong, fine, subangular blocky structure; very hard when dry, very firm

when moist, and very plastic and very sticky when wet; no roots; very slowly permeable; only a few fine pores; slightly acid; gradual irregular boundary; 6 to 12 inches thick.

Substratum—

C 34 to 48 inches +, a matrix of structureless, red (2.5YR 4/6) clay that contains 75 to 90 percent multicolored, soft to fairly hard shale with some chert fragments; very hard when dry, very firm when moist, and plastic and very sticky when wet; no roots; very slowly permeable; about neutral in reaction.

In some places the B_{22} horizon of the subsoil has a few small specks or mottles of gray and black, and the lower subsoil is more strongly mottled than in the profile described. Only one type, Readington silt loam, has been mapped in Frederick County. In some spots the surface texture is somewhat coarser and more nearly like a loam.

Readington silt loam, 0 to 3 percent slopes (RbA).—The wetness of this soil is a more serious problem than erosion. The soil is in capability unit IIIw–11.

Readington silt loam, 0 to 8 percent slopes, moderately eroded (RbB2).—These very moderate slopes may become eroded because slow infiltration and internal drainage cause an increase in runoff. Included are scattered areas totaling 21 acres that have become severely eroded and should be kept in permanent vegetation. This soil, as a whole, is in capability unit IIIe–13.

Roanoke Series

The Roanoke series consists of poorly drained soils developed chiefly on old alluvial terraces but to some extent on low colluvial fans. The material from which they developed was a mixture of greenstone, sandstone, quartzite, and some mica-schist.

The Roanoke soils are characterized by a heavy, very slowly permeable subsoil over a cobbly substratum. They have low moisture-supplying capacity, but they are very wet at times. They are flooded for short periods at very long intervals.

The Roanoke soils are neither extensive nor important in the county. They are associated chiefly with the moderately well drained Augusta and the well drained Thurmont soils, both of which occur on the same kind of parent material.

The following profile of Roanoke silt loam was observed just northeast of Thurmont, in a forest on Old Lime Kiln Road, one-eighth of a mile east of its intersection with Orndorff Road.

Surface soil—

A_1 0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; strong, fine, crumb structure; hard when dry, friable when moist, and slightly sticky and slightly plastic when wet; roots plentiful to abundant; many fine and a few medium pores; moderately high organic matter content; medium acid; abrupt smooth boundary; 8 to 12 inches thick.

Subsoil—

B_{2g} 10 to 24 inches, light olive-brown (2.5Y 5/4) silty clay loam that has abundant, faint, medium mottles of light gray and distinct fine mottles of yellow; strong, medium to coarse, blocky structure, somewhat flattened in the lower part; extremely hard when dry, very firm when moist, and sticky and very plastic when wet; very few roots; slowly permeable; only a few fine pores; neutral; abrupt irregular boundary; 12 to 24 inches thick.

Substratum—

CD_g 24 to 36 inches +, a mass of waterworn gravel and cobblestones, mostly of greenstone, in all stages of decomposition, with a thin filling of structureless olive-brown clay; distinctly stratified.

The Roanoke soils vary considerably in depth to the substratum. Gravel or cobblestones may occur anywhere in the soil but are usually not abundant except in the substratum. In very dry seasons the surface soil cracks, but the cracks usually do not extend into the subsoil.

Roanoke silt loam, moderately deep over cobbles, 0 to 3 percent slopes (RcA).—This is the only Roanoke soil in Frederick County. Some spots are rather cobbly on the surface, but such spots are of little importance. Three acres have slopes of slightly more than 3 percent. The soil is in capability unit Vw–2.

Rohrersville Series

The Rohrersville soils are poorly drained. Most of the profile developed in material weathered from greenstone, but the surface soil developed in an accumulation of fine material washed in from other soils. The soils have poor internal drainage, but their surface drainage is adequate in most places.

Almost all of the Rohrersville soils occur as small spots within areas of Myersville and Fauquier soils in the Middletown Valley. They are commonly cultivated. They are very fertile, and under good management they are highly productive.

The following describes a profile of Rohrersville silt loam in a cultivated area just off Lees Road, about three-tenths of a mile west of its intersection with Catholic Church Road.

Surface soil—

A_{1p} 0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; very weak, medium, crumb structure; moderately hard when dry, friable when moist, and slightly plastic and slightly sticky when wet; many small and medium and a few large pores; roots abundant; this horizon consists entirely of material washed in; slightly acid; smooth very indistinct boundary; 7 inches thick.

A_{12} 7 to 12 inches, dark grayish-brown (10YR 4/2) silt loam that contains numerous small specks of gray and rusty brown; hard when dry, friable when moist, and plastic and slightly sticky when wet; many small and medium and a few large pores; roots abundant; slightly acid; gradual smooth boundary; 4 to 8 inches thick.

A_{13b} 12 to 18 inches, dark grayish-brown (2.5Y 4/2) silty clay loam that has many, distinct, light-gray mottles that are fine in upper part and more coarse in lower part; weak, medium, subangular blocky structure; very hard when dry, firm when moist, and plastic and sticky when wet; roots few; pores are small, except for a few worm channels; medium acid; abrupt smooth boundary; 4 to 8 inches thick.

Subsoil—

B_{gen} 18 to 21 inches, light olive-gray (5Y 6/2) silty clay loam that has many, medium, distinct mottles of yellowish brown (10 YR 5/6); contains many, small to medium, soft to moderately hard, black concretions, probably of manganese, or iron, or both; structureless, very slightly cemented; extremely hard when dry, very firm and sharply

brittle when moist, and slightly plastic but nonsticky when wet; no roots; very slowly permeable; medium acid; abrupt smooth to wavy boundary; 2 to 3 inches thick.

BG 21 to 42 inches, light-gray and brownish-yellow (5Y 7/2 and 10YR 6/6) silty clay loam that has almost equal parts of both colors in distinct, medium to large splotches or mottles; strong, coarse, blocky and subangular blocky structure; very hard when dry, firm when moist, and very plastic and somewhat sticky when wet; no roots; very slowly permeable; very few pores; abrupt irregular to broken boundary; 18 to 30 inches thick.

Substratum—

C 42 to 48 inches +, highly mottled, disintegrated greenstone that grades to hard, undecomposed greenstone.

The A_{1gb} horizon seems to be the A horizon of the original soil, which was later buried under and influenced by the accumulation of material washed in from other soils nearby.

The slightly cemented B_{gcn} horizon varies in consistence. The induration is very weak in most places. This is neither a claypan nor a fragipan. It more closely resembles an incipient iron crust. The concretions are not present in all places. In some areas the entire horizon is very thin or is absent.

The greenstone in the substratum is massive in some places and platy in others.

Rohrersville silt loam, 0 to 8 percent slopes (RdB).—This soil has a profile like that described under the series. Surface drainage is fairly good, but the soil is very wet at times. It is in capability unit IIw–1.

Rohrersville silt loam, 3 to 15 percent slopes, moderately eroded (RdC2).—Because rainfall runs off this soil fairly rapidly, erosion is a more serious management problem than poor drainage. This soil is in capability unit IIIe–13. Included are 25 scattered acres that have slopes a little steeper than 15 percent.

Rough Stony Land

Rough stony land consists of areas so rough, broken, stony, and rocky that they cannot be used for any kind of agriculture except forest. Fragments ranging from small stones up to large boulders are strewn on the surface and imbedded in the soil. Outcrops of hard rock are common. In some of the largest areas the stones are of sandstone or quartzitic sandstone. In other large areas the stones are primarily of hard greenstone. In other places the fragments are micaceous schist or other rock material. The soil material between the stones and the outcrops is most likely to resemble soils of the Highfield, Fauquier, Dekalb, Chandler, and Edgemont series.

Rough stony land is located in the mountainous areas of the county, such as Catoctin Mountain, South Mountain, Sugarloaf Mountain, and Piney Mountain. Many slopes are strongly broken and complex. Most of this land is in forest. It is of value for protection of watersheds and for wildlife.

Rough stony land (Re).—All of the rough stony land in the county is in this one unit. There is not enough stone-free soil for cultivation or even for suitable grazing. Forestry is the best use. This land is in capability unit VIIs–2.

Rowland Series

The Rowland series consists of moderately well drained soils derived from fine material fairly recently deposited on flood plains. This fine material has been washed chiefly from soils that developed from red shale and sandstone. The most common sources of these alluvial materials are soils of the Penn and Readington series, and lesser amounts probably came from the Bucks, Birdsboro, Norton, Raritan, and Athol series.

The Rowland soils occur on narrow flood plains with Bermudian and Bowmansville soils, but they are somewhat more extensive than either. The Rowland soils are not so well drained as the Bermudian soils, but they are much better drained than the Bowmansville soils.

These areas are flooded at times. The internal drainage is slow, and there is practically no runoff in most places. The soils are very wet for fairly long periods. Their impeded drainage is not reflected in the color of the subsoil, because the strong color of the parent material tends to hide the mottling that is typical of a wet soil horizon.

These are fairly good soils, but because of their limited extent they are not important. They are only fairly fertile. Most areas are grazed, and a few areas are still in forest. About a third of the acreage is in crops, chiefly corn and hay.

The following profile of Rowland silt loam is in an area of grazed woodland just south of Legore Road, about 100 yards west of its intersection with Bartgis Road.

Surface soil—

A 0 to 6 inches, dark reddish-brown (5YR 3/4) silt loam; moderate, fine, crumb structure; hard when dry, friable when moist, and plastic and slightly sticky when wet; roots abundant; many fine and some medium pores; medium acid; clear wavy boundary; 3 to 8 inches thick.

Subsoil—

B_1 6 to 14 inches, reddish-yellow (7.5YR 6/6) silt loam; strong, medium, crumb structure; hard when dry, friable when moist, and plastic and slightly sticky when wet; roots plentiful; many fine and some medium pores; strongly acid; clear wavy boundary; 7 to 10 inches thick.

B_{2g} 14 to 29 inches, reddish-brown (5YR 5/4) silty clay loam that is very faintly mottled in some places, but mottles are strongly masked by color of the soil material; strong, medium to coarse, blocky and subangular blocky structure; very hard when dry, firm when moist, and plastic and sticky when wet; few roots; slowly to very slowly permeable; very fine pores; very strongly acid; gradual wavy boundary; 11 to 16 inches thick.

Substratum—

C 29 to 48 inches +, reddish-brown (2.5Y 4/4) fine gravelly loam to silty clay loam; distinctly stratified, yet of strong blocky structure; extremely hard when dry, firm to very firm when moist, and slightly plastic and slightly sticky when wet; no roots; no visible pores; fine gravel is waterworn chert and sandstone, with some hard shale; slightly acid.

Rowland silt loam, 0 to 3 percent slopes (RgA).—There is practically no erosion on this soil. In many places new soil material is accumulating on the surface. Some areas are cultivated, but most of the soil is too

wet and too subject to overflow to be suitable for crops. It is in capability unit Vw–1.

Sequatchie Series

The Sequatchie series consists of very sandy, excessively drained, weakly developed soils that formed in very sandy alluvial materials deposited over irregular beds and ridges of highly siliceous limestone that grades in some places into calcareous sandstone. It is not certain how much of the soil parent material weathered from the rocks and how much was an alluvial deposit.

In Frederick County, the Sequatchie soils occur only on rather broad old alluvial terraces on the western side of the Monocacy River, between Frederick and Buckeystown. They lie next to and merge into areas of Hagerstown loam.

The Sequatchie soils are not extensive, but they are important in some places because they are rather highly productive under good management. They are somewhat droughty, but production is good when enough moisture is present. The Sequatchie soils are commonly very acid in reaction, but those in Frederick County are almost neutral.

The following profile of Sequatchie sandy loam was observed in a cultivated field on Buckeystown Road, one-half mile northeast of its crossing over the Baltimore and Ohio Railroad just above Lime Kiln.

Surface soil—

A_p 0 to 7 inches, dark-brown (10YR 3/3) sandy loam; very weak, medium, granular structure to structureless (single grain); soft when dry, very friable when moist, and nonplastic and nonsticky when wet; roots abundant; many pores of all sizes; neutral to mildly alkaline; clear smooth boundary; 5 to 8 inches thick.

A_3 7 to 13 inches, dark yellowish-brown (10YR 4/4) loamy sand; very weak, medium, granular structure; slightly hard when dry, slightly compact and firm when moist but shatters under moderate pressure, and nonplastic and nonsticky when wet; roots plentiful; rapidly permeable; many medium and some small and large pores; neutral to mildly alkaline; clear wavy boundary; 4 to 7 inches thick.

Subsoil—

B_2 13 to 20 inches, strong-brown (7.5YR 5/6) loamy sand; very weak, fine or medium, subangular blocky structure to structureless (single grain); hard when dry, firm when moist, and nonplastic and nonsticky when wet; slightly cemented, but brittle and breaks into sharp fragments under pressure; roots few; rapidly permeable; many pores of all sizes; neutral; clear to abrupt boundary; 5 to 9 inches thick.

B_3 20 to 38 inches, yellowish-brown (10YR 5/6) sand to very light loamy sand; structureless (single grain); loose when dry, soft when moist, and nonplastic and nonsticky when wet; very few roots; very rapidly permeable; neutral; gradual irregular boundary; 12 to 26 inches thick.

Substratum—

C 38 to 50 inches +, streaked or marbled yellowish-brown and light yellowish-brown (10YR 5/8 and 6/4) sand to gravelly sand; structureless; loose when dry, soft when moist, and nonplastic and nonsticky when wet; no roots; very rapidly permeable; slightly acid in darker colored parts, mildly to strongly alkaline and in some places calcareous in lighter colored parts; very abrupt irregular to broken boundary over gray, hard, siliceous limestone; 0 to 30 inches thick.

The soil is very deep in some places and shallow over limestone in others. The cementation in the B_2 horizon varies from very weak to rather strong. In some places the subsoil is more red than the one described.

Sequatchie sandy loam, neutral variant, 3 to 8 percent slopes, moderately eroded (SaB2).—This soil is eroded, even though it is sandy and readily permeable. It is in capability unit IIe–5.

Sequatchie sandy loam, neutral variant, 8 to 15 percent slopes, moderately eroded (SaC2).—This soil is in capability unit IIIe–5. It includes 22 acres on slopes of slightly more than 15 percent.

Talladega Series

The Talladega series consists of red soils of the mountains and the intermountain uplands. These soils are shallow, immature, and somewhat excessively drained. They developed from highly micaceous material weathered from rather hard talcose and mica schists that contained many intrusions of hard white quartzite, quartzose schist, or both. The mica and talc make these soils feel greasy, especially in the subsoil.

The Talladega soils are droughty, low in fertility, and easily eroded. Their productivity is not great, but they are extensive enough to be important in some places.

The following profile of Talladega stony loam is in a forest on the eastern slope of Catoctin Mountain, 75 feet south of United States Highway No. 340, and 1⅛ miles southwest of its intersection with Teen Barnes Road.

Surface soil—

A_1 0 to 1 inch, very dark brown (10YR 3/2) stony loam; weak, fine, granular structure; slightly hard when dry, very friable when moist, and very slightly plastic but nonsticky when wet; roots plentiful; many pores of all sizes; a few mica flakes; medium acid; clear irregular boundary; ¼ to 3 inches thick.

A_3 1 to 4 inches, strong-brown (7.5YR 5/6) stony loam; weak, medium, crumb structure; hard when dry, very friable when moist, and slightly plastic but nonsticky when wet; roots few to rather plentiful; many pores of all sizes; a few mica flakes; extremely acid; gradual irregular boundary; 2 to 6 inches thick.

Subsoil—

BC 4 to 10 inches, yellowish-red (5YR 5/6) stony loam to light silt loam; moderate, medium, subangular blocky structure; very hard when dry, friable when moist, and sticky and very plastic when wet; very few roots; many small and medium pores; mica flakes plentiful to abundant; contains much partly decomposed mica-schist; very strongly acid; gradual irregular boundary; 4 to 9 inches thick.

Substratum—

C_1 10 to 20 inches, yellowish-red (5YR 5/8), decomposed mica-schist that has a silt loam texture; weak, medium, platy structure; slightly hard when dry, friable when moist, and plastic and sticky when wet; a few large tree roots; many fine but few larger pores; very high mica content gives material a slick or soapy feel; extremely acid; gradual irregular boundary; 10 to 24 inches thick.

C_2 20 to 48 inches +, partly decomposed pink, yellow, gray, white, and brown mica-schist; loose to friable; at undetermined depth grades to hard, undecomposed schist.

In most places the surface soil and subsoil together are 12 to 15 inches thick. In some places they may be more than 20 inches thick, or, depending on how much soil has been lost through erosion, they may total only about 8 inches. The platy structure of the C_1 layer has been inherited from the mica-schist parent material.

In Frederick County, these soils occur mostly on the eastern slopes of Catoctin Mountain, between Yellow Springs and the Potomac River. Soils of the Chandler series occur in the same area. There is so little practical difference between the two series, in characteristics and in management requirements, that they have been mapped in the same undifferentiated soil units, which are listed and described under the Chandler series.

Thurmont Series

The Thurmont series consists of moderately deep to deep, well-drained soils that developed on colluvial debris on mountain foot slopes and on old terraces left by streams flowing from such colluvial areas. The colluvium and alluvium range from fine material to gravel and large stones. Most of the stones are of greenstone, but some are of quartzite, sandstone, or, in a few places, shale. All of the Thurmont soils have a very gravelly to stony subsoil. They vary in the number and size of stone fragments on and near the surface.

In Frederick County these soils occur chiefly along the lower eastern slopes of Catoctin Mountain. They are associated with the Braddock soils, from which they differ by being less red and much less strongly developed. They are fairly fertile and very responsive to good management, but many of them are too cobbly or stony to be easily managed.

Much of the less stony acreage is in orchards, hay, or general crops. The soil is especially well suited to orchards. Almost all of the stony Thurmont soils are still in forest consisting of oaks, hickories, elms, and dogwoods.

The following profile of Thurmont gravelly loam is in a forest along Ford Road, seven-tenths of a mile east of its intersection with Bethel Road.

Surface soil—

A_1 0 to 2 inches, very dark gray (10YR 3/1) gravelly loam; weak, fine, crumb structure; soft when dry, very friable when moist, and nonplastic and nonsticky when wet; roots abundant; many fine and medium and some larger pores; slightly acid; abrupt wavy boundary; 1 to 3 inches thick.

A_2 2 to 7 inches, dark-brown (10YR 3/3) gravelly loam; moderate, medium, granular structure; soft to slightly hard when dry, very friable when moist, and slightly plastic but nonsticky when wet; roots plentiful; many fine and medium and some larger pores; medium acid; abrupt wavy boundary; 3 to 5 inches thick.

Subsoil—

B_{21} 7 to 15 inches, yellowish-brown (10YR 5/4) gravelly sandy clay loam; moderate, fine, subangular blocky structure; slightly hard when dry, friable when moist, and plastic and slightly sticky when wet; few roots; many fine and some medium and larger pores; very strongly acid; gradual wavy to irregular boundary; 7 to 12 inches thick.

B_{22} 15 to 33 inches, strong-brown (7.5YR 5/6) very gravelly, gritty clay loam to sandy clay loam; moderate, fine to medium, subangular blocky structure; hard when dry, firm when moist, and sticky and very plastic when wet; practically no roots; many fine and some medium and larger pores; thin discontinuous clayskins; very strongly acid; gradual irregular boundary; 15 to 22 inches thick.

Substratum—

C 33 to 45 inches +, yellowish-brown (10YR 5/4) very gritty, very gravelly sandy clay loam that has numerous, faint, gray mottles; weak, thick, platy structure; hard when dry, firm when moist, and slightly plastic and slightly sticky when wet; no roots; moderately rapidly permeable; consists mostly of soft, decomposed sandstone and greenstone in a matrix of clayey material; very strongly acid.

The profiles in some areas are more nearly yellow than the profile described.

Thurmont cobbly loam, 0 to 8 percent slopes (TcB).—The profile of this soil is like that of the gravelly loam in the series description, except that the stone fragments are larger. They average about 6 inches in diameter, and many of them are about 10 inches. Cultivation is difficult but not impossible. The cobbly loam is better suited to orchards and hay crops than to row crops. Much of it is still in forest. This soil is in capability unit IIe–25.

Thurmont gravelly loam, 0 to 8 percent slopes, moderately eroded (TcB2).—The profile of this soil is described in detail under the series. It is the most extensive of the Thurmont soils in Frederick County. This soil is used largely for crops. It is in capability unit IIe–25.

Thurmont gravelly loam, 8 to 15 percent slopes, moderately eroded (TcC2).—This soil is especially valued for orchards because it has good air drainage. It is in capability unit IIIe–25.

Thurmont gravelly loam, 15 to 25 percent slopes, moderately eroded (TcD2).—Practically all cleared areas of this soil are in orchards or hay. This soil is in capability unit IVe–25.

Thurmont gravelly and cobbly loams, 0 to 3 percent slopes (TbA).—Gravelly soils and cobbly soils are so mixed in this mapping unit that they could not easily be separated. Most of this unit is in small strips on terraces of larger streams flowing from the mountains. These soils do not erode under ordinary good management. They are in capability unit IIe–25.

Thurmont silt loam, 0 to 3 percent slopes (TdA).—This soil has a profile like that of the gravelly loam described, but the surface layer is slightly finer in texture. The only gravel is in the substratum. Six acres have slopes of slightly more than 3 percent.

This is not a highly fertile soil, but it responds to good management and will not deteriorate when well managed. It is in capability unit I–4.

Thurmont very stony loam, 0 to 15 percent slopes (TeC).—In this soil the stone fragments average more than 10 inches in diameter and are numerous enough to make cultivation impractical. This soil provides

good grazing if properly managed, but most of it is still in forest. This soil is in capability unit VIs–2. Included are 38 acres with slopes of more than 15 percent, but they are managed in the same way as the rest of the soil.

Urbana Series

The Urbana series consists of moderately deep, moderately well drained soils that have a siltpan in their lower subsoil. They developed from material that weathered from sericitic schist.

The Urbana soils are fairly fertile, but they are only moderately productive. In some seasons they are very wet, and in others they are somewhat droughty. The moisture-supplying capacity is rather low. Where the siltpan layer is nearer to the surface, the soils are wetter in rainy seasons and droughtier in dry seasons. Where the siltpan is deeper, the soils are better drained and less wet and sticky.

These soils occur on the more nearly level to gently rolling uplands of the Piedmont Plateau in the eastern and southeastern parts of Frederick County. They are most extensive near Oldfield, just northeast of New London, and between Fountain Mills and Centerville. Most areas are rather small and widely scattered. These soils are associated chiefly with the Manor and Glenelg soils, which developed from micaceous material, and with the Linganore soils, which developed from hard, slaty, dark-colored schist.

The following profile of Urbana silt loam was taken in a forest on Coppermine Road, three-eighths of a mile northwest of its intersection with Liberty Road.

Surface soil—

A_1 0 to 1 inch, olive-gray (5Y 4/2) silt loam; weak, fine, crumb structure; moderately hard when dry, very friable when moist, and slightly plastic and slightly sticky when wet; roots abundant; many fine and medium and some larger pores; slightly acid; gradual smooth to wavy boundary; ½ to 1 inch thick.

A_2 1 to 8 inches, olive-brown (2.5Y 4/4) silt loam; weak, fine, crumb structure; hard when dry, very friable and somewhat fluffy when moist, and plastic and sticky when wet; roots plentiful; many fine and medium and some larger pores; medium acid; clear wavy boundary; 4 to 8 inches thick.

Subsoil—

B_{21} 8 to 14 inches, light olive-brown (2.5Y 5/4) light silty clay loam; many faint mottles or specks of gray and reddish brown; hard when dry, friable when moist, and plastic and very sticky when wet; roots rather few; many fine and some medium and larger pores; medium acid; gradual wavy boundary; 4 to 7 inches thick.

B_{22m} 14 to 22 inches, highly mottled yellowish-brown, gray, and rust-brown very heavy silt loam; compound moderate to strong, medium platy structure and strong, flattened, medium, subangular blocky structure; moderately hard when dry, firm and quite brittle when moist, and very plastic and very sticky when wet; very few roots; many fine pores but no larger pores; this is a well-developed siltpan or fragipan; medium acid; gradual irregular boundary; 6 to 10 inches thick.

Substratum—

C 22 to 48 inches, mottled olive, dark olive-gray, and black (5Y 5/4, 5Y 3/2, and 5Y 2/2) silty clay loam that consists chiefly of soft, decomposed schist; platy or laminar structure; slowly permeable; contains some fragments of hard schist; abrupt irregular to broken boundary; 20 to 40 inches thick.

D_r 48 inches +, green, blue, and violet hard schist. The structure of the C horizon is inherited from the schist parent material.

Schist fragments are common throughout the soil in some places, and some areas contain stones and outcroppings of hard schist. These soils vary in depth to the mottled siltpan layer.

Urbana silt loam, 0 to 3 percent slopes (UaA).—This is the wettest of the Urbana silt loams. The impeded drainage is a more important management problem on this soil than the hazard of erosion. This soil is in capability unit IIIw–11.

Urbana silt loam, 3 to 15 percent slopes, moderately eroded (UaC2).—This is the most extensive Urbana soil in the county. Erosion is very common because of the rapid runoff and is more of a management problem than the impeded drainage. About 28 acres of this soil are stony and are identified on the map by stone symbols. The soil is in capability unit IIIe–13.

Urbana silt loam, 8 to 15 percent slopes, severely eroded (UaC3).—This soil should be cultivated only occasionally and then with great care. It is in capability unit IVe–41.

Urbana silt loam, 15 to 25 percent slopes, moderately eroded (UaD2).—This soil has too much erosion hazard for safe cultivation. It should be kept under permanent vegetation. It is in capability unit VIe–2.

Watchung Series

The Watchung series consists of poorly drained or very poorly drained, shallow soils that have a heavy claypan layer. They developed on material that weathered from blue or violet porcelanite. This metamorphic rock is a shale that has been changed and hardened by contact with intrusions of molten diabase. A few seams or ledges of diabase, several inches thick, penetrate the porcelanite. The main intrusions of diabase now compose the hard, black rock of the ridges nearby.

The Watchung soils are located along and near the Pennsylvania State line, northeast of Emmitsburg. They are of little extent or importance in the county. They occur on nearly level upland flats, next to ridges of diabase, and probably are underlain at some depth by the same rock. They are associated with the Lehigh soils, which developed on similar material but are not so poorly drained. Montalto and Legore soils are on the nearby diabase ridges.

Watchung soils are too difficult to manage and too unproductive for cropping. Fertility is low to moderate. The soils have very fine texture, except in the upper few inches in uneroded areas. They are poorly drained and very wet. If surface drainage and other management practices are used, these soils make fairly good pasture.

The following profile of Watchung silt loam was under a cover of wild hay along Harney Road, two-tenths of a mile southwest of its intersection with Shriver Road.

Surface soil—

A_p 0 to 6 inches, very dark grayish-brown (2.5Y 3/2) silt loam; moderate, fine, crumb structure; hard

when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and medium but few larger pores; strongly acid; clear smooth boundary; 5 to 7 inches thick.

Subsoil—

B_1 6 to 12 inches, olive-gray (5Y 4/2) silty clay; very strong, medium, subangular blocky structure; very hard when dry, firm when moist, and very plastic and very sticky when wet; roots few; many fine but no larger pores; contains a few faint rust-brown specks; medium acid; gradual smooth boundary; 5 to 9 inches thick.

$B_{21}g$ 12 to 26 inches, very dark bluish-gray, very heavy clay that has common, medium, distinct mottles of olive; strong and very strong, medium to coarse, blocky structure; very hard when dry, very firm when moist, and extremely plastic and extremely sticky when wet; no roots; a very few very fine pores; extremely acid; clear wavy boundary; 10 to 20 inches thick.

Substratum—

C 26 to 38 inches, dark grayish-violet clay and partly decomposed porcelanite with many, fine, distinct mottles of olive and dark yellowish brown; structureless; extremely hard when dry, very firm and brittle when moist, and very plastic and very sticky when wet; no roots; extremely slowly permeable; very strongly acid to extremely acid; clear to abrupt irregular boundary; 10 to 30 inches thick.

D_r 38 inches +, violet, dark-blue, and almost black porcelanite.

In some places the surface soil is composed partly or entirely of fine materials washed in from nearby areas. Where this accumulation has been very great, the drainage and productivity of the soil is somewhat improved, but surface wash becomes a management problem.

Watchung silt loam, 0 to 8 percent slopes (WaB).—All of the Watchung soil of the county is in this unit, because all of it has the same capability and management problems. Some areas that have accumulations of fine materials on the surface are especially subject to surface wash. In most areas, even those that are almost level, erosion has been active because practically all rainfall runs off instead of percolating into this almost impermeable soil. In addition, runoff from other areas washes across this soil. In 25 acres that are very severely eroded, the soil has been removed down to the clay lower subsoil. There are many gullies, and some of them are deep. Properly managed, this soil is suitable for pasture, but it should not be grazed when the surface is wet. It is in capability unit Vw–2.

Waynesboro Series

The Waynesboro series consists of deep, well-drained, very well developed soils on old alluvial terraces. They were derived from fine materials that washed from areas of sandstone, shale, and other noncalcareous soil materials.

These soils are not extensive in the county. They occur on high terraces above the Potomac River, from Knoxville eastward approximately to the bend of the river near Lander Post Office. The agricultural productivity of these soils is fairly good, but most of their acreage is occupied by residential developments in the cities of Knoxville and Brunswick. The associated soils are the Huntington soils on the flood plain and the Myersville soils on the uplands above the terraces.

The following profile of Waynesboro gravelly loam was observed in a pasture on Road 464, within the city limits of Brunswick.

Surface soil—

A_p 0 to 6 inches, dark-gray (10YR 4/1) gravelly loam; strong, fine, granular structure; slightly hard when dry, very friable when moist, and nonplastic and nonsticky when wet; roots abundant; many pores of all sizes; medium acid; clear wavy boundary; 5 to 8 inches thick.

Subsoil—

B_{21} 6 to 17 inches, brown (7.5YR 5/4) gravelly sandy clay loam; moderate, medium, subangular blocky structure; moderately hard when dry, fairly firm when moist, and plastic and sticky when wet; roots plentiful; many fine and medium pores; strongly acid; gradual wavy boundary; 12 to 24 inches thick.

B_{22} 17 to 34 inches, yellowish-red (5YR 5/6) gravelly fine sandy clay; strong, medium to coarse, subangular blocky structure; hard when dry, firm when moist, and sticky and very plastic when wet; very few roots; many fine and some larger pores; strongly acid; clear wavy boundary; 14 to 20 inches thick.

Substratum—

C 34 to 49 inches, reddish-yellow (7.5YR 6/6) gravelly and very gritty coarse sandy clay; structureless (massive), or weak, coarse, blocky structure; hard when dry, very firm when moist, and plastic and slightly sticky when wet; no roots; moderately slowly permeable; strongly acid; 20 or more inches thick.

D 49 inches +, a compact mass of waterworn gravel and cobblestones.

Not all of the soil mapped in the Waynesboro series is as red as described in this profile; some of it is more yellowish brown in the subsoil. Some areas have less gravel, and some local spots have a rather sandy surface soil.

Waynesboro gravelly loam, 0 to 8 percent slopes, moderately eroded (WbB2).—Most of this soil is in cities or suburbs, but that part available to agriculture is in capability unit IIe–4.

Waynesboro gravelly loam, 8 to 15 percent slopes, moderately eroded (WbC2).—This soil includes much nonagricultural land, but those areas that can be used for farming are in capability unit IIIe–4.

Wehadkee Series

The Wehadkee series contains poorly drained floodplain soils that consist of materials washed from soils derived from crystalline rocks. In Frederick County, most of this soil material came from the Manor, Glenelg, Linganore, Urbana, and other soils of the Piedmont Plateau in the eastern part of the county, and from the Fauquier and Myersville soils in the Middletown Valley. This parent material is the same as that from which the Congaree and Chewacla soils developed, but the Wehadkee soils are much more poorly drained than either.

The Wehadkee series is extensive in Frederick County. The soils are not highly useful because they are wet and their fertility is comparatively low. In rainy seasons the soils are wet to the surface, and water may be standing on them. Only a small acreage

has ever been drained and cultivated. Ditches and other artificial drains are not always effective in removing surface water. Most of the Wehadkee soil areas in this county have been partly cleared and are used for native pasture or wild hay.

The following profile of Wehadkee silt loam is in an idle area at the intersection of Hoffman Seacrist Road and Daysville Road, northeast of Walkersville. The 2 inches of fine sandy loam that has been washed onto the silt loam surface is not thick enough to change the classification of the soil.

Surface soil—

A_{11} 0 to 2 inches, dark grayish-brown (10YR 4/2) overwash of fine sandy loam; slightly acid; 1 to 3 inches thick.

A_{12} 2 to 16 inches, dark yellowish-brown (10YR 4/4) gritty silt loam that has a few specks or fine mottles of yellow and light gray; weak, medium, crumb structure; hard when dry, rather firm when moist, and plastic and sticky when wet; roots abundant in upper part, fewer in lower part; many fine and medium pores; slightly acid; clear smooth boundary; 10 to 14 inches thick.

Subsoil—

B_g 16 to 40 inches, light olive-brown (2.5Y 5/4) light silt loam strongly mottled with distinct, medium spots of brownish yellow (10YR 6/6); weak, coarse, subangular blocky structure; hard when dry, firm when moist, and plastic and very sticky when wet; very few roots; many fine and medium pores; strongly acid; gradual irregular boundary; 20 to 40 inches thick.

Substratum—

G 40 to 60 inches +, very strongly mottled sandy clay; very weak, coarse, blocky structure; no roots; slowly permeable; strongly acid.

Wehadkee silt loam, 0 to 3 percent slopes (WcA).—Most of the Wehadkee soil is nearly level, although the surface is a little hummocky. All of the Wehadkee soil in Frederick County is silt loam, but some areas have thin sandy deposits on the surface. This soil is of little use except for pasture. It is in capability unit VIw–1.

Worsham Series

The Worsham soils are poorly drained. The subsoil developed from material weathered in place from rather soft micaceous schist. The surface soil developed from material washed in from nearby soils, mostly of the Manor or Glenelg series. The Worsham soils are closely related to the Glenville soils, but they are distinctly more poorly drained.

These are poor soils, not suitable for cultivation. Under the best management they are suitable only for pasture. The natural vegetation consists mainly of maples, birches, willows, and alders.

The Worsham soils develop in upland depressions, at seepage areas on foot slopes, and around the heads of small drainageways. Although they occur in small spots, their total area is fairly extensive in the eastern part of the county.

The following profile of Worsham silt loam was described in a pasture on Repp Road, three-tenths of a mile south of its intersection with Green Valley Road, near Clemonsville.

Surface soil—

A_p 0 to 8 inches, olive-gray (5Y 4/2) silt loam; weak, medium, crumb structure; slightly hard when dry, friable when moist, and plastic and sticky when wet; roots plentiful; many fine and a few larger pores; medium acid; clear smooth boundary.

Subsoil—

B_{2g} 8 to 20 inches, evenly mottled olive-gray and olive (5Y 4/2 and 5/4) silty clay loam; compound weak, thick, platy structure and weak, medium, subangular blocky structure; hard when dry, firm when moist, and plastic and sticky when wet; roots very few; only fine pores visible; strongly acid; gradual smooth boundary; 10 to 16 inches thick.

Substratum—

C_g 20 to 40 inches +, strongly but evenly mottled light-gray and brownish-yellow (5Y 7/2 and 10YR 6/6) clay loam; weak, medium to coarse, irregular blocky structure; no roots; very slowly permeable; strongly acid.

The drainage varies. It is poorest near the center of areas of these soils. In some places, particularly where the soil has never been plowed, the mottling is almost at the surface.

Worsham silt loam, 0 to 8 percent slopes (WdB).—This soil has a profile like the one described for the Worsham series. Two acres have slopes a little steeper than 8 percent. This soil is in capability unit Vw–2.

Worsham very stony silt loam, 0 to 8 percent slopes (WeB).—The profile of this soil is like that described for the series, except that it contains many stones. This soil is not of much use, even for pastures, because in most places it is too stony to plow. It is in capability unit VIIs–4.

Engineering Properties of Soils

This soil survey report contains information that can be used by engineers to—

1. Make soil and land use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
2. Make preliminary estimates of runoff and erosion, for use in designing drainage structures and planning dams and other structures for water and soil conservation.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed soil surveys for the intended locations.
4. Locate sand and gravel for use in structures, rock for crushing, and building stone.
5. Correlate performance of engineering structures with soil mapping units, and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil units for cross-country movements of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs, for the purpose of making soil maps and reports that can be readily used by engineers.

The mapping and descriptive reports are somewhat generalized, however, and should be used only in planning more detailed field surveys to determine the

in-place condition of the soil at the site of the proposed engineering construction.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some words—for example, soil, clay, silt, sand, aggregate, and granular —have special meanings in soil science. Most of these terms, as well as other special terms that are used in the soil survey report, are defined in the glossary at the back of this report.

Some of the information useful for engineering can be obtained from the soil map. It will often be necessary, however, to refer to other parts of the report. The following sections should be most helpful: Descriptions of the Soils, and Soil Classification in Frederick County.

Engineering Classification Systems

Two systems for classification of soils are in general use among engineers. Both will be used in this report. These classification systems are explained in the PCA Soil Primer (*6*).

AASHO classification system

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (*1*). All soil materials are classified in seven principal groups, based on mechanical analysis and plasticity test data. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrades) to A–7 (clay soils having low strength when wet, the poorest soils for subgrades). This classification of various soil materials into the principal groups of this system is shown in table 4.

Within each of the principal groups, the relative engineering value of the soil material is indicated by a group index number. Group indexes range from 0 for the best materials to 20 for the poorest. The group index number is in parentheses after the soil group symbol. The classification of several of the soils of Frederick County according to the AASHO system is shown in table 6.

Unified classification system

Some engineers prefer to use the Unified soil classification system established by the Waterways Experiment Station, Corps of Engineers (*10*). This system is based on identification of soils according to their texture and plasticity and their performance as engineering construction materials. Table 5 shows how the Unified system classifies soils and gives some char-

TABLE 4.—*Classification of soils by American*

General classification	Granular materials (35 percent or less passing No. 200 sieve)				
Group classification	A–1		A–3	A–2	
	A–1–a	A–1–b		A–2–4	A–2–5
Sieve analysis: Percent passing—					
No. 10	50 maximum.				
No. 40	30 maximum.	50 maximum.	51 minimum.		
No. 200	15 maximum.	25 maximum.	10 maximum.	35 maximum.	35 maximum.
Characteristics of fraction passing No. 40 sieve:					
Liquid limit			NP[2]	40 maximum.	41 minimum.
Plasticity index	6 maximum.	6 maximum.	NP[2]	10 maximum.	10 maximum.
Group index	0.	0.	0.	0.	0.
Usual types of significant constituent materials.	Stone fragments, gravel, and sand.	Stone fragments, gravel, and sand.	Fine sand.	Silty gravel and sand.	Silty gravel and sand.
General rating as subgrade.	Excellent to good				

[1] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (pt. 1; ed. 7): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145 49.

acteristics of the soils in use. Table 9 gives the Unified classification of the soil material of the soils of Frederick County.

Soil Data Related to Engineering

Soil samples from 10 of the most important soil series of Frederick County were taken from 15 locations selected by the Soil Conservation Service. These samples were tested by standard procedures in the laboratories of the Bureau of Public Roads, to help evaluate the soils for engineering purposes. The results of these tests and the classification of each sample according to both the AASHO and the Unified systems are given in table 6.

These samples do not represent the entire range of soil characteristics in Frederick County, or even within the 10 soil series sampled. The test results, however, can be used as a general guide in estimating the physical properties of the soils of the county.

This section is intended as a reference guide and not as a manual for using soil materials in engineering.

Table 7 lists the estimated physical properties of the most important horizons, or layers, of the soils of each series in the county. The horizon designations are those that are standard in the Soil Survey Manual (*8*). Most of the properties given are estimates from field examination. Some are from actual tests, as reported in table 6. Each layer is classified separately according to the AASHO and Unified systems.

The thicknesses of layers given in the table are estimated averages, and the actual thickness of a layer at a particular site may differ. Eroded soils have lost most of the original upper layers. The underlying materials are closer to the eroded surface than is indicated in table 7.

Table 8 lists specific features of each soil series that might affect the selection, design, and application of various engineering practices. These features are evaluated from test data and from field performance.

Some features of a soil may be helpful in one kind of engineering work and a hindrance to another. For example, a highly permeable substratum would make a soil unsuitable as a site for a farm pond, but it might make it much more suitable for artificial drainage.

In table 9 the soils of the county and their map symbols are listed, and certain characteristics that are significant to engineering use are described. The classification of each important layer is given according to the Unified classification system. Characteristics that are not important to engineering, such as

Association of State Highway Officials[1]

Granular materials—Con.		Silt-clay materials (More than 35 percent passing No. 200 sieve)				
A–2—Con.		A–4	A–5	A–6	A–7	
A–2–6	A–2–7				A–7–5	A–7–6
35 maximum.	35 maximum.	36 minimum.	36 minimum.	36 minimum.	36 minimum.	36 minimum.
40 maximum. 11 minimum.	41 minimum. 11 minimum.	40 maximum. 10 maximum.	41 minimum. 10 maximum.	40 maximum. 11 minimum.	41 minimum. 11 minimum.[3]	41 minimum. 11 minimum.[3]
4 maximum.	4 maximum.	8 maximum.	12 maximum.	16 maximum.	20 maximum.	20 maximum.
Clayey gravel and sand.	Clayey gravel and sand.	Nonplastic to moderately plastic silty soils.	Highly elastic silts.	Medium plastic clays.	Highly plastic clays.	Highly plastic clays.
Fair to poor						

[2] NP—Nonplastic.

[3] Plasticity index of A–7–5 subgroup is equal to or less than LL minus 30. Plasticity index of A–7–6 subgroup is greater than LL minus 30.

TABLE 5.—*Classification of soil materials by the Unified soil*

Major divisions	Group symbol	Description	Value as foundation material[2]	Value as base course directly under bituminous pavement
Coarse-grained soils (*50 percent or less passing No. 200 sieve*): Gravels and gravelly soils (*more than half of coarse fraction retained on No. 4 sieve*).	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	Excellent	Good
	GP	Poorly graded gravels and gravel-sand mixtures; little or no fines.	Good to excellent	Poor to fair
	GM	Silty gravels and gravel-sand-silt mixtures.	Good	Poor to good
	GC	Clayey gravels and gravel-sand-clay mixtures.	Good	Poor
Sands and sandy soils; (*more than half of coarse fraction passing No. 4 sieve*).	SW	Well-graded sands and gravelly sands; little or no fines.	Good	Poor
	SP	Poorly graded sands and gravelly sands; little or no fines.	Fair to good	Poor to unsuitable
	SM	Silty sands and sand-silt mixtures.	Fair to good	Poor to unsuitable
	SC	Clayey sands and sand-clay mixtures.	Fair to good	Unsuitable
Fine-grained soils (*more than 50 percent passing No. 200 sieve*): Silts and clays (*liquid limit of 50 or less*).	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, and clayey silts of slight plasticity.	Fair to poor	Unsuitable
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays.	Fair to poor	Unsuitable
	OL	Organic silts and organic silty clays having low plasticity.	Poor	Unsuitable
Silts and clays (*liquid limit greater than 50*).	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, and elastic silts.	Poor	Unsuitable
	CH	Inorganic clays having medium to high plasticity, and fat clays.	Poor to very poor	Unsuitable

classification system, selected characteristics,[1] and suggestions for use

Stability for embankments (dams and dikes)	Compaction characteristics and suitable equipment	Approximate range in AASHO maximum dry density[3]	Field (in place) CBR[4]	Subgrade modulus, k	Drainage characteristics	Comparable groups in AASHO classification
		Lb. per cu. ft.	*Percent*	*Lb. per sq. in. per in.*		
Very good stability; use in pervious shells of dikes and dams.	Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	125 to 135	60 to 80	300+	Excellent	A–1.
Reasonable stability; use in pervious shells of dikes and dams.	Good; use crawler-type tractor, pneumatic-tire roller, or steel-wheel roller.	115 to 125	25 to 60	300+	Excellent	A–1.
Reasonable stability; not particularly suited to shells, but may be used for impervious cores or blankets.	Good, but needs close control of moisture; use pneumatic-tire roller or sheepsfoot roller.	120 to 135	20 to 80	200 to 300	Fair to practically impervious.	A–1 or A–2.
Fair stability; may be used for impervious cores in dams and dikes.	Fair; use pneumatic-tire roller or sheepsfoot roller.	115 to 130	20 to 40	200 to 300	Poor to practically impervious.	A–2.
Very good stability; may be used in pervious sections; slope protection required.	Good; use crawler-type tractor or pneumatic-tire roller.	110 to 130	20 to 40	200 to 300	Excellent	A–1.
Reasonable stability; may be used in dike sections having flat slopes.	Good; use crawler-type tractor or pneumatic-tire roller.	100 to 120	10 to 25	200 to 300	Excellent	A–1 or A–3.
Fair stability; not particularly suited to shells, but may be used for impervious cores or dikes.	Good, but needs close control of moisture; use pneumatic-tire roller or sheepsfoot roller.	110 to 125	10 to 40	200 to 300	Fair to practically impervious.	A–1, A–2, or A–4.
Fair stability; use as impervious core for water-control structures.	Fair; use pneumatic-tire roller or sheepsfoot roller.	105 to 125	10 to 20	200 to 300	Poor to practically impervious.	A–2, A–4, or A–6.
Poor stability; may be used for embankments if properly controlled.	Good to poor; close control of moisture is essential; use pneumatic-tire roller or sheepsfoot roller.	95 to 120	5 to 15	100 to 200	Fair to poor	A–4, A–5, or A–6.
Good stability; use in impervious cores and blankets.	Fair to good; use pneumatic-tire roller or sheepsfoot roller.	95 to 120	5 to 15	100 to 200	Practically impervious.	A–4, A–6, or A–7.
Not suitable	Fair to poor; use sheepsfoot roller.[5]	80 to 100	4 to 8	100 to 200	Poor	A–4, A–5, A–6, or A–7.
Poor stability; use in core of hydraulic fill dam; not desirable in rolled fill construction.	Poor to very poor; use sheepsfoot roller.[5]	70 to 95	4 to 8	100 to 200	Fair to poor	A–5 or A–7.
Fair stability on flat slopes; use in thin cores, blankets, and dike sections of dams.	Fair to poor; use sheepsfoot roller.[5]	75 to 105	3 to 5	50 to 100	Practically impervious.	A–7.

TABLE 5.—*Classification of soil materials by the Unified soil*

Major divisions	Group symbol	Description	Value as foundation material[2]	Value as base course directly under bituminous pavement
	OH	Organic clays and organic silts having medium to high plasticity.	Poor to very poor	Unsuitable
Highly organic soils	Pt	Peat and other highly organic soils.	Unsuitable	Unsuitable

[1] Ratings and ranges in test values are for guidance only; design should be based on field survey and test of samples from the construction site.
[2] Ratings are for subgrades and subbases for flexible pavements.

TABLE 6.—*Engineering test data*[1] *for*

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density[2]	
					Maximum dry density	Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Duffield silt loam:						
0.5 mile south of Devilbiss Bridge Road on Dublin Road.	Limestone and calcareous shales.	S31498	0 to 10	A_p	107	17
		S31499	10 to 33	B_{22}	110	17
		S31500	33 to 49	B_3	95	25
Fauquier loam:						
0.4 mile west of Holter Road (Route 59) on Cherry Lane.	Metabasaltic schist	S31492	0 to 8	A_p	96	25
		S31493	8 to 46	B_{21} and B_{22}	101	23
		S31494	46 to 60+	C_1 and C_2	98	24
Fauquier gravelly loam:						
0.25 mile west of Hollow Road on Valleyview Road.	Metabasaltic schist	S31489	0 to 6	A_p	100	24
		S31490	6 to 37	B_{21} and B_{22}	102	22
		S31491	60+	C	96	25
Glenelg silt loam:						
0.14 mile south of Gladhill Road on Browningsville Road.	Phyllitic mica-schist	S31480	0 to 13	A_p and A_2	107	17
		S31481	19 to 38	B_{21} and B_{22}	116	15
		S31482	38 to 84	C	112	16
Glenelg gravelly loam:						
0.25 mile north of Mapleville Road on Emerson Burrier Road.	Phyllitic mica-schist	S31483	0 to 6	A_1 and A_2	97	22
		S31484	6 to 22	B_{21} and B_{22}	109	18
		S31485	22 to 40	C	110	18
Glenelg loam:						
0.25 mile north of old United States Highway No. 40 on Maryland Route No. 75 near New Market.	Chlorite schist	S31477	0 to 8	A_p	110	17
		S31478	8 to 22	B_1 and B_2	116	16
		S31479	22 to 46	C	120	15
Hagerstown silt loam:						
0.37 mile east of New Design Road on Willis Derr Road.	Limestone	S31501	0 to 7	A_p	106	17
		S31502	7 to 38	B_{21} and B_{22}	96	25
		S31503	38 to 60+	C	92	26

classification system, selected characteristics,[1] *and suggestions for use*—Continued

Stability for embankments (dams and dikes)	Compaction characteristics and suitable equipment	Approximate range in AASHO maximum dry density[3]	Field (in place) CBR[4]	Subgrade modulus, k	Drainage characteristics	Comparable groups in AASHO classification
		Lb. per cu. ft.	*Percent*	*Lb. per sq. in. per in.*		
Not suitable	Poor to very poor; use sheepsfoot roller.[5]	65 to 100	3 to 5	50 to 100	Practically impervious.	A–5 or A–7.
Not used in embankments, dams or subgrades for pavements.					Fair to poor	None.

[3] Determined in accordance with test designation T 99–49, AASHO (*1*).
[4] Figures are relative percentages of values obtained from a standard limestone rock (California Bearing Ratio).
[5] Pneumatic-tire rollers may be advisable, particularly when moisture content is higher than optimum.

soil samples taken from 15 soil profiles

Mechanical analyses[3]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—						AASHO	Unified
3 in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
------	100	99	97	91	70	67	50	28	16	28	6	A–4(7)	ML–CL.
------	------	100	99	94	81	78	61	46	36	37	16	A–6(10)	CL.
------	------	100	99	94	90	88	75	62	54	55	26	A–7–6(17)	MH–CH.
100	74	71	70	68	62	60	48	29	18	48	16	A–7–5(9)	ML.
100	91	84	82	79	73	70	57	40	31	60	27	A–7–5(18)	MH.
------	100	99	99	97	87	82	63	39	26	54	18	A–7–5(14)	MH.
100	88	83	81	77	70	66	54	33	23	44	14	A–7–5(9)	ML.
100	97	92	90	83	73	70	55	36	26	47	18	A–7–6(12)	ML–CL.
------	------	100	99	97	93	90	69	32	17	56	19	A–7–5(15)	MH.
100	96	89	84	70	58	55	45	27	16	37	9	A–4(5)	ML.
100	95	88	84	67	55	53	44	29	17	33	11	A–6(4)	ML–CL.
100	95	86	82	68	53	51	41	30	20	40	15	A–6(6)	ML–CL.
100	77	60	54	46	41	40	34	20	13	49	12	A–7–5(2)	GM.
100	95	81	73	63	54	53	47	28	18	38	11	A–6(4)	ML.
100	72	65	62	54	45	43	35	22	12	36	9	A–4(2)	GM.
100	92	88	85	77	66	62	43	21	14	37	10	A–4(6)	ML.
100	97	94	90	84	75	70	50	26	15	32	9	A–4(8)	ML–CL.
------	------	------	100	94	83	78	51	25	13	34	9	A–4(8)	ML–CL.
100	98	92	89	82	73	70	56	31	20	33	10	A–4(8)	ML–CL.
------	------	------	100	98	95	93	87	72	66	63	34	A–7–6(20)	CH.
100	89	85	82	79	75	74	67	62	57	71	37	A–7–5(20)	MH–CH.

TABLE 6.—*Engineering test data*[1] *for*

Soil name and location	Parent material	Bureau of Public Roads report number	Depth	Horizon	Moisture-density[2]	
					Maximum dry density	Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Manor channery loam: 0.25 mile north of Johnsville on Maryland Route No. 641.	Mica-schist	S31476	18 to 36+	C	112	17
Myersville silt loam: On Harmony Road, 1.2 miles southeast of intersection with Maryland Route No. 17 at Myersville.	Schistose metabasalt	S31486	0 to 8	A_p	108	19
		S31487	8 to 34	B_{21} and B_{22}	107	19
		S31488	48+	C	108	18
Myersville loam: On Valleyview Road, 150 feet east of intersection with Maryland Route No. 17.	Schistose metabasalt	S31495	0 to 10	A_p	102	20
		S31496	10 to 29	B_{21} and B_{22}	105	20
		S31497	46+	C	108	19
Norton gravelly silt loam: At intersection of Old Lime Kiln Road and Orndorff Road.	Colluvium	S31504	8 to 15	A_2	114	14
		S31505	15 to 31	B_{21}	119	14
		S31506	31 to 48	B_{22}	110	18
Penn silt loam: On Good Intent Road, 0.5 mile west of intersection with Maryland Route No. 641.	Shale and sandstone	S31473	6 to 19	B_2	111	16
		S31474	19 to 31	C	112	17
		S31475	31+	D	117	15
Penn shaly loam: On Bollinger Creek Road, 0.5 mile north of intersection with Harney Road; near Maryland-Pennsylvania line.	Shale and sandstone	S31468	3 to 14	BC	112	15
		S31469	14 to 36	C	115	15
Readington silt loam: On Old Lime Kiln Road, 0.37 mile east of intersection with United States Highway No. 15.	Shale and sandstone	S31470	0 to 7	A_p	100	21
		S31471	12 to 28	B_{22}	110	18
		S31472	34 to 48+	C	113	16
Sequatchie sandy loam: 0.5 mile north of Baltimore and Ohio Railroad crossing on United States Highway No. 15.	Sandy alluvium over limestone.	S31507	7 to 13	A_2	124	10
		S31508	13 to 34	B	108	15
		S31509	34 to 48+	C	104	18

[1] Tests performed by Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway Officials (AASHO).

[2] Based on AASHO Designation: T99 57, Method A.

[3] Mechanical analyses according to the American Association of State Highway Officials Designation: T 88. In many tests, results by this procedure differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service

soil samples taken from 15 soil profiles—Continued

Mechanical analyses[3]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—						AASHO	Unified
3 in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
99	71	53	45	36	29	27	23	16	10	36	9	A-2-4(0)	GM.
100	97	94	92	85	76	73	52	27	18	41	11	A-7-5(9)	ML.
------	100	98	96	91	86	84	62	36	35	44	16	A-7-6(11)	ML-CL.
------	------	------	100	97	85	79	51	28	20	45	14	A-7-5(11)	ML.
------	100	98	96	89	82	80	58	30	21	39	11	A-6(8)	ML.
100	96	94	92	86	81	78	56	30	19	37	11	A-6(8)	ML-CL.
------	------	------	100	95	79	75	51	17	10	37	9	A-4(8)	ML.
100	81	73	71	57	44	43	35	21	14	31	9	A-4(2)	GC.
100	89	84	82	67	53	45	44	30	21	32	13	A-6(5)	CL.
100	96	92	90	76	64	62	53	42	35	50	27	A-7-6(14)	CL.
------	------	100	99	94	82	78	55	31	19	28	5	A-4(8)	ML-CL.
100	97	97	96	92	80	76	53	31	21	32	10	A-4(8)	ML-CL.
96	43	29	29	27	22	22	14	8	5	28	7	A-2-4(0)	GM-GC.
100	99	89	72	55	51	51	43	23	13	31	7	A-4(3)	ML-CL.
100	59	48	40	32	28	27	25	14	8	29	7	A-2-4(0)	GM-GC.
------	------	100	99	93	84	82	68	42	30	43	16	A-7-6(11)	ML-CL.
------	------	100	99	96	92	89	68	47	38	45	24	A-7-6(15)	CL.
------	100	97	95	91	86	84	66	43	32	38	19	A-6(12)	CL.
100	99	99	98	72	30	28	22	13	8	16	2	A-2-4(0)	SM.
100	97	97	97	70	14	14	13	10	9	(4)	(4)	A-2-4(0)	SP-SM.
------	------	------	100	76	12	12	10	6	6	(4)	(4)	A-2-4(0)	SP-SM.

(SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 mm. in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 mm. in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming texture classes of soils.

[4] Nonplastic.

TABLE 7.—*Estimated physical properties of*

Soil series	Depth from surface	Probable classification		Estimated percent passing—	
		AASHO	Unified	No. 200 sieve	No. 4 sieve
	Inches				
Athol	0 to 6	A–4	ML–SM	50	85
	6 to 32	A–6	CL	70	90
	32 to 56	A–2	GM–GC	35	50
	56+				
Augusta	0 to 8	A–4	ML	50	80
	8 to 31	A–6	CL	55	70
	31 to 48+	A–2	GC	25	45
Bermudian	0 to 6	A–4	ML–CL	85	100
	6 to 28	A–4 or A–6	ML–CL	85	100
	28 to 48+	A–6 or A–7	CL–ML	85	100
Birdsboro	0 to 5	A–4	ML	75	90
	5 to 16	A–6 or A–7	ML–CL	75	85
	16 to 30	A–4 to A–6	GC	45	60
	30 to 36+				
Bowmansville	0 to 6	A–4	ML	60	100
	6 to 25	A–4	SM	40	100
	25 to 36+	A–3	SP–SM	10	100
Braddock	0 to 5	A–4	SM	45	75
	5 to 23	A–6	ML–CL	55	70
	23 to 49	A–2	GC	30	50
	49 to 60	A–2	GC	15	30
Brandywine	0 to 17	A–2	SM–SC	35	75
	17 to 90	A–1	GP–GM	5	40
	90+				
Bucks	0 to 6	A–4	ML–CL	75	100
	6 to 18	A–6	CL–ML	80	100
	18 to 38	A–7	CL or CH	80	100
	38 to 42+	A–2	GM	15	30
Captina	0 to 18	A–4	ML	65	85
	18 to 34	A–7	CL or CH	70	85
	34 to 54+	A–2	GC	25	35
Cardiff	0 to 7	A–2 or A–4	SM	35	75
	7 to 21	A–2	GM	25	35
	21 to 48+	A–1	GW–GM	10	20
Catoctin	0 to 14	A–4	ML	55	75
	14 to 26	A–2	GM–GC	25	40
	26 to 60	A–1	GM	15	30
	60+				
Chalfont	0 to 15	A–4	ML	55	80
	15 to 30	A–7	CH	60	90
	30 to 42+	A–1	GM	10	30

soil series of Frederick County, Maryland

Range in permeability	Structure	Reaction
Inches per hour		*pH*
0.63 to 2.0	Strong, coarse, crumb	7.4 to 7.8
.06 to 0.20	Strong, medium, subangular blocky	7.4 to 7.8
.20 to 0.63	Weakly cemented	7.4 to 7.8
	(Hard limestone breccia)	
.63 to 2.0	Moderate, medium, crumb	5.0 to 5.5
.02 to 0.06	Weak, medium, blocky	4.5 to 5.0
.63 to 2.0	None	4.5 to 5.0
.63 to 2.0	Weak, medium, crumb	5.6 to 6.0
.20 to 0.63	Weak, fine, crumb	5.6 to 6.0
.20 to 0.63	Weak, fine, crumb to granular	5.1 to 6.0
.63 to 2.0	Weak, fine, crumb	4.5 to 5.5
.06 to 0.20	Moderate, medium, subangular blocky	4.0 to 4.5
.06 to 0.20	Weak, thick, platy	4.0 to 4.5
	(Hard shale and sandstone)	
.63 to 2.0	Weak, coarse, crumb	6.1 to 6.5
.63 to 2.0	Weak, medium, granular	6.1 to 6.5
2.00 to 6.3	Very weak, coarse, blocky	6.6 to 7.3
.63 to 2.0	Weak, fine, crumb	5.6 to 6.0
.20 to 0.63	Strong, fine, blocky	5.1 to 5.5
.06 to 0.20	Moderate, coarse, blocky	4.5 to 5.0
.02 to 0.06	None	
.63 to 2.0	Fine, crumb to weak, subangular blocky	5.1 to 5.5
2.00 to 6.3	Single-grain	4.5 to 5.5
	(Hard gneiss)	
.20 to 0.63	Moderate, medium, granular	6.6 to 7.3
.06 to 0.20	Moderate, fine to medium, subangular blocky	6.1 to 6.5
.06 to 0.20	Strong, fine to medium, subangular blocky	5.1 to 5.5
.02 to 0.06	None	5.1 to 5.5
.20 to 0.63	Strong, medium, granular to subangular blocky	4.0 to 4.5
.20 to 0.63	Very strong, medium, subangular blocky	4.0 to 4.5
.02 to 0.06	Moderate, medium, platy	4.0 to 4.5
2.00 to 6.3	Strong, fine, granular	5.1 to 6.0
2.00 to 6.3	Strong, fine, subangular blocky	4.5 to 5.0
2.00 to 6.3	None	4.5 to 5.0
.20 to 2.0	Weak, fine, crumb to moderate, subangular blocky	5.6 to 6.0
.20 to 0.63	Strong, medium, platy	5.1 to 5.5
.06 to 0.63	None	6.1 to 6.5
	(Hard metabasalt)	
.20 to 0.63	Strong, fine, granular to moderate, subangular blocky	5.1 to 5.5
.02 to 0.06	Strong, medium to coarse, subangular blocky	5.6 to 6.0
	(Hard shale)	5.6 to 6.0

TABLE 7.—*Estimated physical properties of*

Soil series	Depth from surface	Probable classification		Estimated percent passing—	
		AASHO	Unified	No. 200 sieve	No. 4 sieve
	Inches				
Chandler	0 to 9	A–4	ML	60	85
	9 to 38	A–2	GM–GC	15	30
	38+				
Chester	0 to 10	A–4	ML	65	90
	10 to 40	A–6 or A–7	CL or MH	75	95
	40 to 56+	A–2	GC	25	50
Chewacla	0 to 32	A–4	ML	75	100
	32 to 48+	A–2	SC–GC	25	60
Clymer	0 to 8	A–2	SM	30	85
	8 to 28	A–4 or A–6	SM–SC	40	80
	28 to 60	A–6 or A–2	SC–SM	35	80
	60+				
Colbert	0 to 8	A–4	ML–CL	80	100
	8 to 36+	A–6	CL	65	100
Conestoga	0 to 14	A–4	ML–CL	75	100
	14 to 28	A–4	CL–ML	80	100
	28 to 50	A–6	CL–ML	80	90
	50 to 60	A–7	CL	50	75
	60+				
Congaree	0 to 44	A–4	ML	65	100
	44 to 60+	A–2	SM–SC	20	60
Croton	0 to 16	A–4	ML	85	100
	16 to 26	A–6	ML–CL	90	100
	26 to 42+	A–7	CL or CH	90	100
Dekalb	0 to 2	A–2 or A–4	SM	35	80
	2 to 60	A–1 or A–2	GM	15	25
	60+				
Duffield [1]	0 to 10	A–4	ML–CL	70	99
	10 to 33	A–6	CL	81	100
	33 to 49	A–7	MH–CH	90	100
	49 to 55	A–4	CL–ML	50	60
	55+				
Edgemont	0 to 22	A–4	SC–GC	45	65
	22 to 38	A–6	CL	55	70
	38 to 46	A–5 or A–7	MH or ML	55	75
	46+				
Elioak	0 to 6	A–4	ML	60	75
	6 to 40	A–4	ML–CL	65	80
	40 to 60+	A–5 or A–6	CL–ML	80	95
Elk	0 to 22	A–4	ML	65	90
	22 to 37	A–4	CL	70	90
	37 to 44+	A–2	GC	20	55

soil series of Frederick County, Maryland—Continued

Range in permeability	Structure	Reaction
Inches per hour		*pH*
.20 to 2.0	Weak, fine to medium, granular to subangular blocky	4.5 to 6.0
.06 to 0.20	Moderate, medium, subangular blocky to schistose	4.0 to 5.0
	(Hard mica schist)	
.20 to 2.0	Weak, fine to medium, crumb	5.6 to 6.5
.06 to 0.20	Moderate to strong, coarse, subangular blocky	5.1 to 5.5
.02 to 0.06	Irregular blocky to schistose	5.1 to 6.0
.20 to 0.63	Weak, fine to medium, crumb	4.5 to 5.5
.06 to 0.20	Weak, medium, platy	4.5 to 5.0
.63 to 2.0	Weak to moderate, medium, crumb or granular	4.5 to 5.0
.20 to 0.63	Moderate, fine to medium, subangular blocky	4.5 to 5.5
.06 to 0.20	Moderate, medium, blocky and subangular blocky	4.5 to 5.0
	(Quartzitic sandstone)	
.20 to 0.63	Weak, fine, granular	7.4 to 7.8
.02 to 0.06	Weak, coarse, blocky and subangular blocky	4.5 to 6.0
.20 to 0.63	Moderate, fine, subangular blocky to crumb	7.4 to 7.8
.02 to 0.20	Moderate, medium, subangular blocky	6.6 to 7.3
.02 to 0.20	Strong, fine to medium, subangular blocky	6.6 to 7.3
.20 to 0.63	None	7.4 to 7.8
	(Calcareous schist and marble)	
.63 to 2.0	Weak, fine to coarse, crumb or granular	5.1 to 6.0
2.00 to 6.3	None	5.1 to 5.5
.06 to 0.63	Moderate and strong, medium to coarse, crumb	7.4 to 7.8
<0.02	Moderate, medium, platy and subangular blocky	5.1 to 5.5
<0.02	Strong, fine to medium, platy and subangular blocky	5.1 to 6.0
2.00 to 6.3	Weak, fine, crumb to granular	4.0 to 5.0
2.00 to 6.3	Weak granular to none	4.0 to 4.5
	(Hard quartzitic sandstone)	
2.00 to 6.3	Weak, fine, crumb	7.4 to 7.8
.20 to 0.63	Moderate, medium, subangular blocky	5.1 to 6.0
.06 to 0.20	Weak, fine, platy and subangular blocky	5.1 to 5.5
.06 to 0.20	Laminar	6.1 to 6.5
	(Interbedded limestone and shale)	
.20 to 0.63	Moderate, medium, crumb to subangular blocky	4.0 to 5.0
.20 to 0.63	Weak, medium, subangular blocky	4.5 to 5.0
.06 to 0.20	Very weak, coarse, blocky and subangular blocky	4.5 to 5.0
	(Hard quartzite or quartzose schist)	
.63 to 2.0	Moderate, fine, granular	5.1 to 6.0
.20 to 0.63	Weak to strong, medium subangular blocky	4.5 to 5.0
.06 to 0.20	Very weak, coarse, blocky	4.5 to 5.0
.20 to 0.63	Weak, fine, crumb to subangular blocky	5.1 to 6.0
.06 to 0.20	Moderate, fine to medium, subangular blocky	5.1 to 5.5
.63 to 2.0	None	5.1 to 5.5

TABLE 7.—*Estimated physical properties of*

Soil series	Depth from surface	Probable classification		Estimated percent passing—	
		AASHO	Unified	No. 200 sieve	No. 4 sieve
	Inches				
Fauquier [1]	0 to 7	A–7	ML	66	75
	7 to 41	A–7	MH	73	88
	41 to 60+	A–7	MH	90	100
Frankstown	0 to 21	A–4	ML–CL	65	90
	21 to 35	A–6	CL–ML	55	75
	35 to 48	A–1	GM	20	40
	48+				
Glenelg [1]	0 to 6	A–7	GM	41	60
	6 to 22	A–6	ML	54	81
	22 to 40	A–4	GM	45	65
	40+				
Glenville	0 to 24	A–4	ML–CL	65	90
	24 to 38	A–4	CL–ML	70	95
	38 to 44	A–7	MH	60	100
	44+				
Guthrie	0 to 10	A–4	ML–CL	75	100
	10 to 42+	A–7	CL or CH	80	100
Hagerstown [1]	0 to 7	A–4	ML–CL	73	92
	7 to 38	A–7	CH	95	100
	38 to 60	A–7	MH–CH	75	85
	60+				
Highfield	0 to 10	A–4	ML	50	90
	10 to 39	A–4	ML–CL	65	95
	39 to 50	A–2	GM	20	40
	50+				
Huntington	0 to 84+	A–4	ML–CL	85	100
Lansdale	0 to 22	A–4	ML–CL	50	80
	22 to 36+	A–1	GM	10	25
Lantz	0 to 9	A–4	ML–CL	75	90
	9 to 22	A–6	CL	75	85
	22 to 36+	A–6	GC	40	50
Legore	0 to 10	A–4	ML–CL	65	80
	10 to 26	A–7	CL or CH	65	80
	26 to 66	A–6 or A–7	CL–SC	50	60
	66+				
Lehigh	0 to 7	A–4	GM–GC	40	60
	7 to 24	A–7	CH–CL	50	65
	24 to 48	A–2	GC	30	40
	48+				
Lindside	0 to 30	A–4	ML	75	100
	30 to 44	A–6	CL–ML	75	95
	44 to 60+	A–7	CH	90	100

soil series of Frederick County, Maryland—Continued

Range in permeability	Structure	Reaction
Inches per hour		*pH*
0.20 to 0.63	Moderate, fine to medium, crumb	6.6 to 7.3
.06 to 0.20	Moderate and strong, fine to medium, subangular blocky	5.6 to 6.5
.06 to 0.20	Schistose	5.6 to 6.5
.20 to 0.63	Weak to strong, fine to medium, subangular blocky	6.1 to 6.5
.06 to 0.20	Moderate to strong, fine, subangular blocky	6.1 to 6.5
.02 to 0.06	Laminar	
	(Shaly or shabby limestone)	
.63 to 2.0	Weak, medium, crumb to granular	5.1 to 5.5
.20 to 0.63	Strong, medium, subangular blocky	5.1 to 5.5
.20 to 0.63	Schistose	5.1 to 5.5
	(Hard mica schist)	
.06 to 0.20	Moderate to strong, fine, crumb and subangular blocky	5.1 to 6.0
.00 to 0.02	Moderate, medium, platy and subangular blocky	5.6 to 6.0
	Schistose	5.6 to 6.0
	(Mica schist and quartzite)	
.20 to 0.63	Strong, fine, crumb	7.4 to 7.8
.00 to 0.02	Moderate to strong, fine to coarse, blocky	5.6 to 7.4
.20 to 0.63	Strong, medium to coarse, crumb	6.6 to 7.3
.02 to 0.06	Strong, fine to medium, subangular blocky	5.1 to 6.5
.20 to 0.63	None to very weak coarse blocky	5.1 to 5.5
	(Hard limestone)	
.63 to 2.0	Weak, fine, crumb to granular	5.1 to 6.0
.06 to 0.20	Weak to moderate, fine, subangular blocky	4.5 to 5.5
.06 to 0.20	Weak, coarse, subangular blocky	4.5 to 5.0
	(Hard metabasalt)	
.06 to 2.0	Thin to medium, platy and coarse, crumb	6.1 to 7.3
.06 to 0.20	Strong, medium, crumb to subangular blocky	5.6 to 6.5
	None	5.1 to 5.5
.02 to 0.06	Weak, coarse to very coarse, crumb	5.6 to 6.0
.02 to 0.06	Weak, fine to medium, subangular blocky	5.6 to 6.0
.00 to 0.02	Weak, thin, platy and coarse, blocky	5.6 to 6.0
.06 to 0.20	Moderate, fine, subangular blocky	5.6 to 6.5
.02 to 0.06	Strong, coarse, subangular blocky	5.6 to 6.0
	Laminar	5.6 to 6.0
	(Hard diabase)	
.20 to 0.63	Weak, fine, crumb	5.1 to 5.5
.02 to 0.06	Strong, medium, platy and blocky	5.1 to 5.5
.02 to 0.06	Laminar	6.6 to 7.3
	(Hard porcelanite)	
.20 to 0.63	Weak, medium, crumb to weak, thin, platy	6.1 to 6.5
.06 to 0.20	Weak, thick, platy	6.6 to 7.3
.02 to 0.06	Weak, coarse, blocky	6.6 to 7.3

TABLE 7.—*Estimated physical properties of*

Soil series	Depth from surface	Probable classification		Estimated percent passing—	
		AASHO	Unified	No. 200 sieve	No. 4 sieve
	Inches				
Linganore	0 to 33	A–2	GM–GC	20	40
	33+				
Manor [1]	0 to 4	A–2	SM–GM	35	70
	4 to 18	A–2	GM–GC	35	60
	18 to 36+	A–2	GM	29	53
Montalto	0 to 6	A–4	ML–CL	80	95
	6 to 30	A–6	CL	90	100
	30 to 50	A–7	CH	90	100
	50 to 64	A–6	CL–SC	50	75
	64+				
Myersville [1]	0 to 10	A–7	ML	79	96
	10 to 40	A–7	ML–CL	84	96
	40 to 48	A–7	ML	82	100
	48+				
Norton [1]	0 to 15	A–4	GC	44	73
	15 to 31	A–6	CL	53	84
	31 to 48	A–7	CL	64	92
	48 to 58+	A–4	GC	45	65
Penn [1] (nonshaly surface)	0 to 6	A–4	ML	75	95
	6 to 31	A–4	ML–CL	81	98
	31+	A–2	GM–GC	22	29
Penn [1] (shaly surface)	0 to 3	A–4	SM	40	75
	3 to 14	A–4	ML–CL	51	89
	14 to 36+	A–2	GM–GC	28	48
Raritan	0 to 16	A–4	ML–CL	80	95
	16 to 34	A–6	CL	80	90
	34 to 42+	A–4	GM	45	65
Readington [1]	0 to 34	A–7	CL ML	90	100
	34 to 48+	A–6	CL	86	97
Roanoke	0 to 10	A–4	ML	80	95
	10 to 24	A–7	CL	85	95
	24 to 36+	A–2	GC	20	30
Rohrersville	0 to 21	A–4 or A–6	ML–CL	75	100
	21 to 42	A–5 or A–7	ML–CL	90	100
	42 to 48+	A–4	MH	50	70
Rowland	0 to 48+	A–4 or A–6	ML–CL	80	95
Sequatchie [1]	0 to 38	A–2	SM	21	99
	38 to 50	A–2	SP–SM	12	100
	50+				
Talladega	0 to 4	A–4	ML	65	90
	4 to 48	A–2	GC	15	30
	48+				

soil series of Frederick County, Maryland—Continued

Range in permeability	Structure	Reaction
Inches per hour		*pH*
0.06 to 0.63	Crumb to moderate, coarse, subangular blocky	6.1 to 6.5
	(Hard phyllitic schist)	
2.00 to 6.3	Weak, fine to medium, crumb to granular	4.5 to 5.0
.63 to 2.0	Strong, medium, crumb	4.5 to 5.0
	Schistose	4.5 to 5.0
.20 to 0.63	Moderate, coarse, crumb	6.1 to 6.5
.02 to 0.06	Moderate to strong, medium, subangular blocky	6.1 to 6.5
.02 to 0.06	Moderate, medium, subangular blocky	6.1 to 6.5
.20 to 0.63	None	6.6 to 7.3
	(Hard diabase)	
.20 to 0.63	Moderate, fine, crumb	5.6 to 6.0
.06 to 0.63	Strong, medium to coarse, subangular blocky	5.6 to 6.0
.20 to 0.63	None	5.1 to 5.5
	(Hard metabasalt schist)	
.20 to 0.63	Moderate to strong, fine, crumb	5.1 to 6.0
.06 to 0.20	Moderate, medium, subangular blocky	5.1 to 5.5
.06 to 0.20	Weak, platy and strong, fine, subangular blocky	5.1 to 5.5
.02 to 0.06	Weak, laminar and weak, fine, subangular blocky	4.5 to 5.0
.63 to 6.3	Moderate to strong, fine, granular	4.5 to 6.0
.20 to 0.63	Strong, medium, subangular blocky, shaly	5.1 to 5.5
	(Shale)	
.63 to 6.3	Strong, fine, granular	5.1 to 6.0
.20 to 0.63	Strong, coarse, granular	5.1 to 5.5
	(Shale)	5.1 to 5.5
.06 to 0.20	Moderate to strong, fine, subangular blocky	5.1 to 6.0
.02 to 0.06	Weak, coarse, platy	5.1 to 5.5
	Stratified	5.1 to 5.5
.00 to 0.02	Strong, fine, crumb and subangular blocky	5.1 to 5.5
.00 to 0.02	None	6.6 to 7.3
.06 to 0.20	Strong, fine, crumb	5.6 to 6.0
.00 to 0.02	Strong, medium and coarse, blocky	6.6 to 7.3
	None	
.00 to 0.02	Weak, medium, crumb to subangular blocky	5.6 to 6.0
.00 to 0.02	Strong, coarse, blocky and subangular blocky	5.1 to 5.5
	None	
.02 to 0.06	Moderate, fine, crumb to strong blocky, stratified	5.1 to 6.5
2.00 to 6.3	Granular to single-grain	6.6 to 7.8
2.00 to 6.3	Single-grain	6.6 to 7.3
	(Hard limestone)	
.63 to 6.3	Weak, fine to medium, crumb or granular	4.0 to 4.5
.20 to 0.63	Moderate, medium, subangular blocky to schistose	4.0 to 5.0
	(Micaceous and talcose schist)	

TABLE 7.—*Estimated physical properties of*

Soil series	Depth from surface	Probable classification		Estimated percent passing—	
		AASHO	Unified	No. 200 sieve	No. 4 sieve
Thurmont	0 to 7	A–4	ML–CL	60	85
	7 to 33	A–6	GC–CL	50	65
	33 to 45+	A–2	GM–GC	20	40
Urbana	0 to 8	A–4	ML	80	100
	8 to 14	A–6	ML–CL	80	100
	14 to 22	A–7	ML–CL	80	100
	22 to 48	A–4	ML	55	70
	48+				
Watchung	0 to 6	A–4	CL–ML	80	100
	6 to 38	A–7	CH	85	95
	38+				
Waynesboro	0 to 17	A–4	ML–CL	55	80
	17 to 34	A–7	CL–GC	50	75
	34 to 49	A–6	GC GM	40	60
	49+	A–1	GW–GM	10	20
Wehadkee	0 to 16	A–4	ML	75	100
	16 to 40	A–4	ML–CL	80	100
	40 to 60+	A–7	CL or CH	60	100
Worsham	0 to 20	A–4	ML–CL	80	100
	20 to 40+	A–7	CH	75	100

[1] Certain horizons of these series were sampled for engineering tests. More than one profile was sampled for several of the series. The test data are given in table 6.

soil series of Frederick County, Maryland—Continued

Range in permeability	Structure	Reaction
Inches per haur		*pH*
0.63 to 2.0	Weak, fine, crumb to moderate, medium, granular	5.6 to 6.5
.06 to 0.20	Moderate, fine to medium, subangular blocky	4.5 to 5.0
.63 to 2.0	Weak, thick, platy	4.5 to 5.0
.20 to 0.63	Weak, medium, crumb	5.6 to 6.5
.06 to 0.20	Weak, fine, subangular blocky	5.6 to 6.0
.02 to 0.06	Platy and irregular blocky	5.6 to 6.0
	Schistose	
	(Hard actinolitic schist)	
.20 to 0.63	Strong, fine, crumb	4.5 to 5.0
.00 to 0.02	Very strong, medium, blocky to massive	4.0 to 6.0
	(Hard porcelanite and diabase)	
.20 to 0.63	Strong, fine, granular to moderate, medium, subangular blocky	5.1 to 6.0
.06 to 0.20	Strong, medium to coarse, subangular blocky	5.1 to 5.5
.06 to 0.20	Very weak, coarse, blocky	5.1 to 5.5
2.00 to 6.3	None	
.20 to 0.63	Weak, medium, crumb	5.6 to 6.0
.20 to 0.63	Weak, coarse, subangular blocky	5.1 to 5.5
.02 to 0.06	Very weak, coarse, blocky	5.1 to 5.5
.02 to 0.06	Weak, thick, platy and weak, medium, crumb	5.1 to 6.0
.00 to 0.02	Weak, medium to coarse, irregular blocky	5.1 to 5.5

TABLE 8.—*Features of soil series*

Soil series	Dominant slope	Factors that may affect highway work				
		Suitability for winter grading	Recommended location of grade-line with respect to ground surface	Suitability as source of—		
				Subgrade fill	Topsoil	Sand and gravel
	Percent					
Alluvial land	0 to 3	Unsuitable	Above high water	Fair	Very poor	Deposits in some places.
Athol	0 to 25	Unsuitable	Anywhere	Fair	Good; gravelly	Unsuitable
Augusta	0 to 15	Unsuitable	Depends on stones in some places.	Poor	Fair; stony	Gravel in some places.
Bermudian	0 to 3	Unsuitable	Above high water	Poor	Good	Unsuitable
Birdsboro	0 to 8	Unsuitable	Anywhere	Fair	Fair to good	Unsuitable
Bowmansville	0 to 8	Unsuitable	Above high water	Poor	Poor to fair	Unsuitable
Braddock	0 to 25	Unsuitable	Depends on stones in some places.	Good, stony	Fair	Gravel in some places.
Brandywine	0 to 55	Fair[1]	Anywhere	Good	Poor to fair	Good
Bucks	0 to 8	Unsuitable	Anywhere	Poor to fair	Good	Unsuitable
Captina	0 to 8	Unsuitable	Four feet above ditch invert.[2]	Poor	Fair to good	Unsuitable
Cardiff	0 to 55	Fair[1]	Anywhere	Good	Poor to fair	Unsuitable
Catoctin	0 to 55	Unsuitable[1]	Depends on bedrock.	Fair to good	Fair to good	Unsuitable
Chalfont	0 to 15	Unsuitable	Four feet above ditch invert.[2]	Poor to fair	Fair	Unsuitable
Chandler	0 to 45	Unsuitable[1]	Anywhere	Fair; micaceous	Fair	Unsuitable
Chester	0 to 15	Unsuitable	Anywhere	Fair to good	Good	Unsuitable
Chewacla	0 to 3	Unsuitable	Above high water	Poor to fair	Fair	Unsuitable
Clymer	0 to 20	Unsuitable	Depends on stones and bedrock.	Stony	Stony	Unsuitable
Colbert	0 to 3	Unsuitable	Near surface	Poor to fair	Poor to fair	Unsuitable
Conestoga	0 to 25	Unsuitable	Anywhere	Fair	Good	Unsuitable
Congaree	0 to 8	Unsuitable	Above high water	Fair	Good	Unsuitable
Croton	0 to 8	Unsuitable	Four feet above ditch invert.[2]	Poor	Fair	Unsuitable
Dekalb	0 to 35	Fair[1]	Depends on stones and bedrock.	Fair	Poor	Sand in some places.
Duffield	0 to 25	Unsuitable	Depends on bedrock.	Fair to good	Good	Unsuitable
Edgemont	0 to 60	Unsuitable[1]	Depends on stones and bedrock.	Good; stony	Fair; stony	Unsuitable
Elioak	0 to 15	Unsuitable	Anywhere	Good	Good	Unsuitable
Elk	0 to 15	Unsuitable	Anywhere	Fair to good	Good	Gravel in some places.
Fauquier	0 to 45	Unsuitable	Depends on bedrock.	Poor to fair	Good	Unsuitable
Frankstown	0 to 25	Unsuitable	Depends on bedrock.	Fair to good	Good	Unsuitable
Glenelg	0 to 45	Unsuitable	Depends on bedrock.	Fair to good	Good	Unsuitable
Glenville	0 to 8	Unsuitable	Four feet above ditch invert.[2]	Poor	Good	Unsuitable
Guthrie	0 to 3	Unsuitable	Four feet above ditch invert.[2]	Poor	Poor	Unsuitable
Hagerstown	0 to 25	Unsuitable	Depends on rock outcrops and depth of bedrock.	Poor; clayey	Good	Unsuitable
Highfield	0 to 45	Unsuitable[1]	Depends on stones and bedrock.	Good; stony	Good; stony	Unsuitable
Huntington	0 to 3	Unsuitable	Above high water	Fair to good	Good	Unsuitable
Lansdale	0 to 25	Unsuitable	Anywhere	Good	Good	Unsuitable
Lantz	0 to 15	Unsuitable	Four feet above ditch invert.	Poor	Fair	Unsuitable

that may affect engineering

Factors that may affect soil and water conservation work for—				
Drainage	Irrigation	Pond sites	Fill material for earth dams	Terraces, diversions
Not recommended	Not recommended	Cobblestones, permeable substrata.	Gravel or cobblestones	Unsuitable.
Not needed	Rocks in rocky phases	Suitable	Suitable	Rocks in rocky phases.
Gravel and stones	Gravel and stones	Gravel and stones	Gravel and stones	Gravel and stones.
Not needed	Suitable	Suitable	Variable suitability	Not needed.
Not needed	Suitable	Suitable	Suitable	No limitations.
High water table	Not recommended	Permeable substrata	Variable suitability	Not needed.
Not needed	Gravel and stones	Gravel and stones	Gravel and stones	Gravel and stones.
Not needed	Thin solum	Highly permeable substrata.	Too permeable material	Thin solum.
Not needed	Suitable	Suitable	Poorly graded material	No limitations.
Fragipan	Fragipan	Fragipan	Fragipan	No limitations.
Not needed	Thin solum	Too permeable substrata	Too many channers	Thin solum.
Not needed	Thin solum	Too thin solum	Too many channers	Thin solum.
Fragipan	Fragipan	Fragipan	Fragipan	No limitations.
Not needed	Thin solum	Too thin solum	Too much mica	Thin solum.
Not needed	Suitable	Suitable	Suitable	No limitations.
High water table	Slow permeability	Suitable	Variable suitability	Not needed.
Not needed	Stones	Stones	Too many stones	Stones.
Very slow permeability	Very slow permeability	Suitable	Poorly graded material	Very slow permeability.
Not needed	Suitable	Suitable	Suitable	No limitations.
Not needed	Suitable	Suitable	Variable suitability	Not needed.
Fragipan	Fragipan	Suitable	Poorly graded material	Very slow permeability.
Not needed	Thin solum, stones	Stones; too permeable substrata.	Stones, too permeable material.	Stones in some places.
Not needed	Suitable	Suitable	Suitable	No limitations.
Not needed	Stones in some places	Stones in some places	Stones in some places	Stones in some places.
Not needed	Suitable	Suitable	Suitable	No limitations.
Not needed	Suitable	Suitable	Suitable	No limitations.
Not needed	Suitable	Shaly subsoil	Shale fragments	No limitations.
Not needed	Suitable	Suitable	Suitable	No limitations.
Fragipan	Fragipan	Fragipan	Fragipan	No limitations.
Fragipan	Fragipan	Fragipan	Fragipan	No limitations.
Not needed	Rocks in some places	Rocks in some places	Poorly graded material	Rocks in some places.
Not needed	Stones in some places	Stones in some places	Stones in some places	Stones in some places.
Not needed	Suitable	Suitable	Variable suitability	No limitations.
Not needed	Thin solum in places	Suitable	Shale fragments	Thin solum in some places.
Very slow permeability	Very slow permeability	Suitable	Poorly graded material	Very slow permeability.

TABLE 8.—*Features of soil series*

Soil series	Dominant slope	Factors that may affect highway work				
		Suitability for winter grading	Recommended location of grade-line with respect to ground surface	Suitability as source of—		
				Subgrade fill	Topsoil	Sand and gravel
	Percent					
Legore	0 to 50	Unsuitable	Depends on stones and bedrock.	Poor	Good; stony	Unsuitable
Lehigh	3 to 15	Unsuitable	Four feet above ditch invert.[2]	Fair	Fair	Unsuitable
Lindside	0 to 8	Unsuitable	Above high water	Poor to fair	Fair to good	Unsuitable
Linganore	0 to 55	Poor to fair[1]	Depends on bedrock.	Good	Poor to fair	Unsuitable
Manor	0 to 55	Unsuitable	Depends on bedrock.	Good	Fair	Unsuitable
Melvin	0 to 3	Unsuitable	Above high water	Poor	Fair to good	Unsuitable
Montalto	0 to 45	Unsuitable	Depends on stones in some places, depends on bedrock.	Poor	Good	Unsuitable
Myersville	0 to 50	Unsuitable	Depends on bedrock.	Good	Good	Unsuitable
Norton	0 to 45	Unsuitable	Anywhere	Good	Good; gravelly	Unsuitable
Penn	0 to 50	Unsuitable	Depends on bedrock.	Good; shaly	Good; shaly	Unsuitable
Raritan	0 to 8	Unsuitable	Four feet above ditch invert.[2]	Poor	Fair to good	Unsuitable
Readington	0 to 8	Unsuitable	Four feet above ditch invert.[2]	Poor	Fair to good	Unsuitable
Roanoke	0 to 3	Unsuitable	Above high water	Poor	Poor	Unsuitable
Rohrersville	0 to 15	Unsuitable	Four feet above ditch invert.	Poor	Good	Unsuitable
Rough stony land	0 to 60	Unsuitable	Depends on bedrock.	Very poor	Very poor	Unsuitable
Rowland	0 to 3	Unsuitable	Above high water	Poor to fair	Fair	Unsuitable
Sequatchie	3 to 15	Fair to good	Depends on rock outcrops and bedrock.	Good	Good	Good; sand
Talladega	0 to 45	Unsuitable[1]	Depends on bedrock.	Fair; micaceous	Fair	Unsuitable
Thurmont	0 to 25	Unsuitable	Depends on stones in some places, depends on bedrock.	Good	Fair	Gravel in some places.
Urbana	0 to 25	Unsuitable	Four feet above ditch invert.[2]	Poor to fair	Fair	Unsuitable
Watchung	0 to 8	Unsuitable	Four feet above ditch invert.[2]	Very poor	Poor	Unsuitable
Waynesboro	0 to 15	Unsuitable	Anywhere	Good	Good	Unsuitable
Wehadkee	0 to 3	Unsuitable	Above high water	Poor	Poor	Unsuitable
Worsham	0 to 8	Unsuitable	Four feet above ditch invert.	Poor	Fair	Unsuitable

[1] Rock excavation may be permitted during the winter.

that may affect engineering—Continued

Factors that may affect soil and water conservation work for—				
Drainage	Irrigation	Pond sites	Fill material for earth dams	Terraces, diversions
Not needed	Stones in some places	Stones in some places	Poorly graded material	Stones in some places.
Slatiness; claypan	Slatiness; claypan	Slatiness; claypan	Slatiness; claypan	No limitations.
Water table Not needed	Slow permeability Thin solum	Suitable Too thin solum	Variable suitability Too many channers	Slow permeability. Thin solum.
Not needed	Channers	Micaceous to slaty substrata.	Too many channers	Thin solum.
Water table Not needed	Very slow permeability Stones in some places	Very good Stones in some places	Poorly graded material Poorly graded material	Not needed. Stones in some places.
Not needed	Stones in some places	Stones in some places	Stones in some places	Stones in some places.
Not needed Not needed	Gravel Thin solum in places	Gravel Suitable	Gravel Shale fragments	No limitations. Thin solum in some places.
Fragipan	Fragipan	Fragipan	Fragipan	No limitations.
Claypan	Claypan	Suitable	Poorly graded material	Very slow permeability.
Very slow permeability Slow permeability	Very slow permeability Slow permeability	Suitable Suitable	Poorly graded material Poorly graded material	Very slow permeability. Slow permeability.
Not needed	Not possible	Not suitable	Too many stones	Not possible.
Water table Not needed	Slow permeability Very sandy solum	Suitable Very sandy solum	Poorly graded material Very sandy solum	Not needed. No limitations.
Not needed	Thin solum	Too thin solum	Too much mica	Thin solum.
Not needed	Stones in some places	Stones in some places	Stones in some places	Stones in some places.
Fragipan	Fragipan	Fragipan	Poorly graded material	No limitations.
Claypan	Claypan	Suitable	Poorly graded material	Very slow permeability.
Not needed Water table Very slow permeability	Suitable Slow permeability Very slow permeability	Suitable Suitable Suitable	Suitable Poorly graded material Poorly graded material	No limitations. Not needed. Very slow permeability.

[2] When claypan or fragipan is removed in earthwork, gradeline can be anywhere.

TABLE 9.—*Soil map units and selected characteristics significant to engineering*

Map symbol	Name	Selected characteristics significant to engineering
Aa	Alluvial land	Recent alluvium from various sources, mostly from areas of sandstone, greenstone, and quartzite. Its characteristics vary. Most areas are moderately well drained. Deposits range from thin to thick. In most places the material is gravelly to cobbly. Most of it is classified as GM, but in some places it is GW, GP, SW, SP, or SM.
AbA	Athol gravelly loam, 0 to 3 percent slopes	Well-drained, gravelly, upland soils developed in residuum from conglomerates and breccias of limestone and shale. They are ML to GM in the surface layer, CL in the subsoil, and GM to GC in the parent material below a depth of about 32 inches. The depth to bedrock varies, but in most places it is more than 4 feet. The water table is very deep. The soil is neutral to mildly alkaline, but it is calcareous near the bedrock.
AbB2	Athol gravelly loam, 3 to 8 percent slopes, moderately eroded.	
AbC2	Athol gravelly loam, 8 to 15 percent slopes, moderately eroded.	
AbD2	Athol gravelly loam, 15 to 25 percent slopes, moderately eroded.	
AcB2	Athol rocky loam, 0 to 15 percent slopes, moderately eroded.	Well-drained, gravelly, upland soil developed in residuum from conglomerates and breccias of limestone and shale. It is ML to GL in the surface layer, CL in the subsoil, and GM to GC in the parent material. There is a considerable range in depth to bedrock between outcropping ledges and boulders of limestone conglomerate or breccia. The water table is very deep. The soil is neutral to mildly alkaline, but it is calcareous near the bedrock.
AeB	Augusta silt loam, 0 to 8 percent slopes	Moderately well drained soil on terraces and old colluvial fans, developed from mixtures of sandstone, greenstone, and quartzite. It is ML to a depth of 6 inches, then CL to about 30 inches. The substratum is GC, which is very gravelly and cobbly. The subsoil between depths of about 20 and 30 inches is platy and slowly permeable. The water table is high in some seasons, that is, at a depth of about 3 feet. The soil reaction is strongly acid.
AdA	Augusta gravelly loam, 0 to 3 percent slopes	Moderately well drained soils on terraces and old colluvial fans, developed from mixtures of sandstone, greenstone, and quartzite. The surface soil is ML, which contains 15 to 30 percent of gravel. The subsoil is CL, which in most places contains 15 to 30 percent of gravel. The substratum is GC, which is very gravelly and cobbly. The subsoil between depths of about 20 and 30 inches is platy and slowly permeable. The water table is high in some seasons, that is, at a depth of about 3 feet. The soil reaction is strongly acid.
AdB2	Augusta gravelly loam, 3 to 15 percent slopes, moderately eroded.	
AgB	Augusta very stony loam, 0 to 8 percent slopes	Moderately well drained soil on terraces and old colluvial fans, developed from mixtures of sandstone, greenstone, and quartzite. The surface soil is ML, the subsoil is CL, and the substratum is GC. All of the layers contain many stones and large cobblestones. The subsoil between depths of about 20 and 30 inches is platy and slowly permeable. The water table is high in some seasons, that is, at a depth of about 3 feet. The soil reaction is strongly acid.
BaA	Bermudian fine sandy loam, 0 to 3 percent slopes	Well-drained, deep, recent alluvium washed from Triassic shale and sandstone. Most of the material is ML, but some ranges from SM in the surface layer to CL in the subsoil. Some areas have substrata of sand, gravel, or both, below a depth of 48 inches. The water table is high in some seasons, that is, at depths of 4 to 6 feet. In most places the material is medium acid, but in others the reaction ranges to strongly acid in the subsoil.
BbA	Bermudian silt loam, 0 to 3 percent slopes	
BcA	Birdsboro silt loam, 0 to 3 percent slopes	Well-drained terrace soils, developed on old deposits of alluvium from areas of Triassic shale and sandstone. The material is ML at the surface, but it is almost CL at about 20 inches. At about 30 inches it is SC or GC. Shale bedrock lies unconformably beneath the alluvium at a depth of about 30 inches. The water table is high in some seasons, that is, at a depth of about 4 feet. The reaction ranges from strongly acid at the surface to extremely acid in lower layers.
BcB2	Birdsboro silt loam, 3 to 8 percent slopes, moderately eroded.	
BdB	Bowmansville silt loam, 0 to 8 percent slopes	Poorly drained recent alluvium, washed from areas of Triassic shale and sandstone. The surface is ML, but the material grades to SM in lower depths. Below 25 to 30 inches, the material is SP or SM. The water table is normally between 24 and 36 inches in depth, but in some seasons it is higher or lower. The material is slightly acid to neutral throughout.
BgB2	Braddock gravelly loam, 3 to 8 percent slopes, moderately eroded.	Well-drained, gravelly to cobbly soils on old colluvial fans, developed from material of greenstone, sandstone, and quartzite. The surface soil ranges from GM to SM. The subsoil at a depth of about 24 inches ranges from ML to CL that is almost GC. The material at depths of 60 inches or more is GC. The bedrock of shale or sandstone lies unconformably beneath the colluvial material. The water table is normally very deep. The reaction is medium acid to very strongly acid.
BeB	Braddock cobbly loam, 3 to 8 percent slopes	
BhC2	Braddock gravelly and cobbly loams, 8 to 15 percent slopes, moderately eroded.	

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
BmD2	Braddock soils, 15 to 25 percent slopes, moderately eroded.	Well-drained, gravelly to cobbly soils on old colluvial fans, developed from material of greenstone, sandstone, and quartzite. The surface soil ranges from GM to SM. The subsoil at a depth of about 24 inches ranges from ML to CL that is almost GC. In some places, large stones are in the soil. The material at depths of 60 inches or more is GC. The bedrock of shale or sandstone lies unconformably beneath the colluvial material. The water table is normally very deep. The reaction is medium acid to very strongly acid.
BkB	Braddock very stony loam, 3 to 15 percent slopes.	Well-drained, very stony soil on old colluvial fans, developed from material derived from greenstone, sandstone, and quartzite. The surface soil ranges from GM to SM. The subsoil at a depth of about 24 inches ranges from ML to CL that is almost GC. The material at depths of 60 inches or more is GC. The bedrock of shale or sandstone lies unconformably beneath the colluvial material. The water table is normally very deep. The reaction is medium acid to very strongly acid.
BnB2	Brandywine gravelly loam, 0 to 15 percent slopes, moderately eroded.	Well-drained to excessively drained, shallow, upland soils developed in residuum from dikes of coarse-grained gneiss. The material is SM to SC to a depth of about 15 inches. The parent material below is GP to GW; it consists of disintegrated but only slightly weathered gneiss of fine gravel texture. It is a good source of fine gravel or very coarse sand. In most places this material is 6 feet or more in depth over unaltered gneiss. The water table is within the bedrock. In most places the soil is strongly acid, but in a few places it is almost neutral.
BnD2	Brandywine gravelly loam, 15 to 25 percent slopes, moderately eroded.	
BnE3	Brandywine gravelly loam, 15 to 55 percent slopes, severely eroded.	
BoA	Bucks silt loam, 0 to 3 percent slopes	Well-drained, deep, upland soils developed in residuum from Triassic rocks, mostly shale and some sandstone. The soil is ML to CL to a depth of nearly 40 inches. Weathered friable shale lies at and below a depth of 40 inches. The weathered shale is GM, but most of the fragments are fairly soft. The water table is very deep. Where the soil has not been limed, it is medium acid to strongly acid.
BoB2	Bucks silt loam, 3 to 8 percent slopes, moderately eroded.	
CaB2	Captina silt loam, 0 to 8 percent slopes, moderately eroded.	Moderately deep terrace soil that has impeded drainage; developed on old deposits of alluvium from areas of impure limestone. The soil is ML to a depth of about 18 inches. A fragipan, CL, begins at a depth of about 18 inches and becomes gravelly at about 34 inches. Below the fragipan, the material is GC. Bedrock lies unconformably at great depth. In some seasons the water table is high, that is, within the fragipan. The soil is extremely acid.
CbB2	Cardiff channery loam, 0 to 8 percent slopes, moderately eroded.	Somewhat excessively drained, shallow, upland soils, developed in residuum from quartzitic slate. To a depth of about 6 inches, the soil is GM to SM. It is GM to about 20 inches in depth, and GW below that layer. This material grades slowly into hard rock. The water table is within the bedrock. The soil is strongly acid to very strongly acid.
CbC2	Cardiff channery loam, 8 to 15 percent slopes, moderately eroded.	
CbC3	Cardiff channery loam, 8 to 15 percent slopes, severely eroded.	
CbD2	Cardiff channery loam, 15 to 25 percent slopes, moderately eroded.	
CbD3	Cardiff channery loam, 15 to 25 percent slopes, severely eroded.	
CbE4	Cardiff channery loam, 15 to 55 percent slopes, very severely eroded.	
CbE2	Cardiff channery loam, 25 to 45 percent slopes, moderately eroded.	
CbF2	Cardiff channery loam, 45 to 55 percent slopes, moderately eroded.	
CcB2	Catoctin channery silt loam, 0 to 10 percent slopes, moderately eroded.	Well-drained to somewhat excessively drained, shallow, upland soils developed in residuum from greenstone schist. In most places the soil is ML to a depth of 12 or 14 inches. Below this, the subsoil is GM or in some places GC to a depth of about 36 inches. The substratum is GW to a depth of about 5 feet. Bedrock lies at a depth of about 5 feet. The water table is within the bedrock. The soil is medium acid to strongly acid to a depth of about 26 inches, and slightly acid below.
CcC2	Catoctin channery silt loam, 10 to 20 percent slopes, moderately eroded.	
CcC3	Catoctin channery silt loam, 10 to 20 percent slopes, severely eroded.	
CcD2	Catoctin channery silt loam, 20 to 35 percent slopes, moderately eroded.	
CcD3	Catoctin channery silt loam, 20 to 35 percent slopes, severely eroded.	
CcF2	Catoctin channery silt loam, 35 to 55 percent slopes, moderately eroded.	
CcE4	Catoctin channery silt loam, 20 to 55 percent slopes, very severely eroded.	

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
CdA CdB	Chalfont silt loam, 0 to 3 percent slopes Chalfont silt loam, 3 to 15 percent slopes	Moderately well drained to somewhat poorly drained, upland soils developed in residuum from light-colored Triassic shale. The soil is ML to a depth of about 15 inches. A heavy, very slowly permeable fragipan, CH, extends from a depth of about 15 to about 30 inches. Below 30 inches is hard shale bedrock. The water table is normally within the bedrock, but in some seasons it is high, that is, within the fragipan. The soil is medium acid to strongly acid.
CgB2 CgC2 CgD2 CgD3	Chandler and Talladega silt loams, 0 to 10 percent slopes, moderately eroded. Chandler and Talladega silt loams, 10 to 20 percent slopes, moderately eroded. Chandler and Talladega silt loams, 20 to 35 percent slopes, moderately eroded. Chandler and Talladega silt loams, 20 to 35 percent slopes, severely eroded.	Somewhat excessively drained, immature, shallow, upland soils developed in residuum from highly micaceous and talcose schist. The Chandler soils are dominantly yellow, and the Talladega soils are characteristically red. Both are ML to depths of 4 to 6 inches. The Chandler soils are ML to MH between 6 and 9 inches in depth. Both Chandler and Talladega soils are GC in the subsoil to depths of about 20 inches. The parent materials are GM to GC to a depth of 3 to 4 feet, then they grade into undecomposed schist. The subsoils and parent materials of both series are highly micaceous. The water table is very deep. Both series range from slightly acid to medium acid in the surface layers and to extremely acid in the parent materials.
CeB2 CeC2 CeD2 CeD3 CeE2	Chandler and Talladega channery loams, 0 to 10 percent slopes, moderately eroded. Chandler and Talladega channery loams, 10 to 20 percent slopes, moderately eroded. Chandler and Talladega channery loams, 20 to 35 percent slopes, moderately eroded. Chandler and Talladega channery loams, 20 to 35 percent slopes, severely eroded. Chandler and Talladega channery loams, 35 to 45 percent slopes, moderately eroded.	Somewhat excessively drained, immature, shallow, upland soils developed in residuum from highly micaceous and talcose schist. The Chandler soils are yellow, and the Talladega soils are red. Both are ML to depths of 4 to 6 inches, but they contain more than 20 percent of fragments or chips of schist. From 6 to 9 inches in depth, the Chandler soils are ML to MH and contain 20 percent or more of fragments or chips of schist. Where the schist fragments are numerous enough, the entire soil profile of both series is classified as GM or GC. At 3 or 4 feet, the GM or GC parent materials grade into undecomposed schist. The subsoils and parent materials of both series are highly micaceous. The water table is very deep. Both series range from slightly acid to medium acid in the surface layers and to extremely acid in the parent materials.
ChC2 ChD2	Chandler and Talladega very stony loams, 0 to 20 percent slopes, moderately eroded. Chandler and Talladega very stony loams, 20 to 45 percent slopes, moderately eroded.	Somewhat excessively drained, immature, shallow, upland soils developed in residuum from highly micaceous and talcose schist. The Chandler soils are yellow, and the Talladega soils are red. To depths of 4 to 6 inches, both soils are ML; they contain more than 20 percent of fragments or chips of schist. Between 6 and 9 inches in depth, the Chandler soils are ML to MH and contain more than 20 percent of fragments or chips of schist. The soils contain many boulders of schist and massive quartzite. In some places the profiles contain enough schist fragments to be classified as GM or GC throughout. The depth to bedrock of mica-schist covers an extremely wide range, and the soils contain numerous outcrops of mica-schist and quartzite. The subsoils and parent materials of both series are highly micaceous. The water table is very deep. Both series range from slightly acid to medium acid in the surface layers and to extremely acid in the parent materials.
CkA2 CkB2 CkC2	Chester loam, 0 to 3 percent slopes, moderately eroded. Chester loam, 3 to 8 percent slopes, moderately eroded. Chester loam, 8 to 15 percent slopes, moderately eroded.	Well-drained, deep, upland soils developed in residuum from mica-schist and quartzite. The surface soil is ML to a depth of about 10 inches; the subsoil is mostly CL to a depth of about 40 inches; and the substratum is GC to the bedrock, which is at a depth of about 5 feet or more. The water table is very deep. The surface soil is slightly acid, and the subsoil is strongly acid. The substratum below a depth of 40 inches is medium acid.
CmA	Chewacla silt loam, 0 to 3 percent slopes	Somewhat poorly drained recent alluvium washed from areas of crystalline rocks, mostly schist but partly gneiss and quartzite. The soil is ML to a depth of about 30 inches; below that it is GC or SC, depending on the proportion of gravel and sand. The structure is platy and permeability is slow below a depth of 30 inches. The water table normally ranges in depth from about 3 to 5 feet, but in some seasons it is higher or lower. The soil is strongly acid to very strongly acid in reaction.
CnB	Clymer very stony loam, 0 to 20 percent slopes	Well-drained, deep, upland soil developed in residuum from sandstone, particularly quartzitic sandstone. The surface layer is mostly SM. The subsoil grades to SC at a depth of 30 to 40 inches. Below that, the material is SM. The water table is very deep. The depth to bedrock is 4 to 6 feet or more. Many stones and boulders of quartzitic sandstone are present throughout the profile. The soil is very strongly acid.

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
CoA	Colbert silt loam, deep variant, 0 to 3 percent slopes.	Somewhat poorly drained, upland soil developed in residuum from impure limestone. The surface soil is ML; it grades into the slowly permeable CL substratum at a depth of 36 inches or more. The soil is alternately very wet and very dry. In some seasons the water table is high, that is, at about 4 to 6 feet. The soil is very deep over bedrock. The surface soil is slightly alkaline; below about 15 inches it is very strongly acid.
CpB2	Conestoga silt loam, 0 to 8 percent slopes, moderately eroded.	Well-drained, deep, upland soils developed in residuum from calciferous schist and marble. The soil is ML to a depth of about 1 foot, then CL to bedrock at a depth of 5 feet or more. The water table is very deep. The soil reaction is slightly acid to mildly alkaline, and the bedrock is calcareous.
CpC2	Conestoga silt loam, 8 to 15 percent slopes, moderately eroded.	
CpD2	Conestoga silt loam, 15 to 25 percent slopes, moderately eroded.	
CrA	Congaree silt loam, 0 to 3 percent slopes	Well-drained, deep, recent alluvium washed from areas of crystalline rocks, mostly schist, metabasalt, gneiss, and quartzite. The soil itself is ML throughout. The substratum is gravelly, sandy, or both below a depth of 4 feet; it is SM to SC in most places. The water table is below 4 feet most of the time, but in some seasons it is higher for short periods. The soil is medium acid to strongly acid.
CsA	Congaree silt loam, local alluvium, 0 to 3 percent slopes.	
CsB	Congaree silt loam, local alluvium, 3 to 8 percent slopes.	
CtB	Croton silt loam, overwashed, 0 to 8 percent slopes.	Poorly drained, shallow soil on local colluvium from areas of Triassic sandstone and shale. The soil is ML to a depth of about 16 inches, and CL to CH below. A well-developed, platy, very slowly permeable fragipan is present between about 16 and about 36 inches in depth. In some seasons the water table is high, that is, at 2 to 4 feet in depth. The reaction in most places is strongly acid to very strongly acid.
DaB2	Dekalb loam, 0 to 10 percent slopes, moderately eroded.	Excessively drained, shallow or skeletal, upland soils developed in residuum from highly quartzitic sandstone. The immediate surface is SM to SW. From a depth of 2 to 4 inches, the soil is chiefly GM to GW down to the bedrock. All layers of the soil contain some gravel or fragments of sandstone; in some places these are numerous enough to make the soil a channery phase. The depth to the bedrock ranges from 4 feet to many feet. The soil is very permeable and nonplastic throughout. The water table is very deep. The soil is very strongly acid to extremely acid.
DaC2	Dekalb loam, 10 to 20 percent slopes, moderately eroded.	
DbC	Dekalb very stony loam, 0 to 35 percent slopes	Excessively drained, shallow or skeletal, upland soil developed in residuum from highly quartzitic sandstone. The immediate surface is SM to SW, and the rest of the soil is chiefly GM to GW down to bedrock. The soil contains abundant gravel, stone, slabs, boulders, and outcrops of quartzitic sandstone. The depth to the bedrock has a considerable range. The soil is very permeable and nonplastic throughout. The water table is very deep. The soil is very strongly acid to extremely acid.
DcA	Duffield silt loam, 0 to 3 percent slopes	Well-drained, deep, upland soils developed in residuum from thinly interbedded limestone and shale. The immediate surface is ML, then the soil is CL to a depth of about 33 inches; below that it is MH to CH to a depth of about 50 inches. The bedrock lies at a depth of 4 to 5 feet. The water table is very deep. The normal soil is medium acid to strongly acid in the solum, neutral in the parent material, and calcareous in the bedrock. The Frankstown soils are like the Duffield soils in characteristics that are significant to engineering.
DeA	Duffield and Frankstown silt loams, 0 to 3 percent slopes.	
DeB2	Duffield and Frankstown silt loams, 3 to 8 percent slopes, moderately eroded.	
DeC2	Duffield and Frankstown silt loams, 8 to 15 percent slopes, moderately eroded.	
DeD2	Duffield and Frankstown silt loams, 15 to 25 percent slopes, moderately eroded.	
DdA2	Duffield and Frankstown shaly silt loams, 0 to 3 percent slopes, moderately eroded.	Well-drained, deep, upland soils developed in residuum from thinly interbedded limestone and shale. The soil contains shale fragments throughout. It is ML to CL to a depth of about 3 feet, then GM in the parent material to a depth of 4 to 6 feet or more. The bedrock lies at a depth of 4 to 5 feet. The water table is very deep. The normal soil is medium acid to strongly acid in the solum, neutral in the parent material, and calcareous in the bedrock.
DdB2	Duffield and Frankstown shaly silt loams, 3 to 8 percent slopes, moderately eroded.	
DdC2	Duffield and Frankstown shaly silt loams, 8 to 15 percent slopes, moderately eroded.	
EaB2	Edgemont gravelly loam, 0 to 8 percent slopes, moderately eroded.	Well-drained, moderately deep to deep, upland soils developed in residuum from quartzite, quartzose schist, and quartzite conglomerate. The entire profile is gravelly. The surface soil is SC to GC to a depth of about 10 inches. The subsoil is ML or CL to GC to nearly 40 inches in depth. The substratum is MH or ML to GM to the bedrock, which lies at a depth of about 4 feet. The water table is very deep. The soil is very strongly acid to extremely acid.
EaC2	Edgemont gravelly loam, 8 to 15 percent slopes, moderately eroded.	
EaD2	Edgemont gravelly loam, 15 to 25 percent slopes, moderately eroded.	
EaE	Edgemont gravelly loam, 25 to 45 percent slopes	
EbC	Edgemont very stony loam, 0 to 20 percent slopes.	Well-drained, moderately deep to deep, upland soils developed in residuum from quartzite, quartzose schist, and quartzite con-

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
EbE	Edgemont very stony loam, 20 to 60 percent slopes.	glomerate. The entire profile is gravelly and contains many stones, some boulders, and some outcrops of quartzite, schist, and conglomerate. The surface soil is SC to GC to a depth of about 10 inches. The subsoil is ML or CL to GC to nearly 40 inches in depth. The substratum is MH or ML to GM to the bedrock, which lies at a depth of about 4 feet. The water table is very deep. The soil is very strongly acid to extremely acid.
EcB2	Edgemont-Chandler channery loams, 0 to 10 percent slopes, moderately eroded.	Well-drained, moderately deep to deep, upland soils developed in residuum from quartzite, quartzose schist, quartzite conglomerate, and highly micaceous schist. The entire profile is channery. The surface soil is SC to GC to a depth of about 10 inches. The subsoil is ML or CL to GC from 10 to nearly 40 inches in depth. The substratum is MH or ML to GM to the bedrock, which lies at a depth of about 4 feet. The water table is very deep. The soil is very strongly acid to extremely acid. The areas of Edgemont soil and of Chandler soil cannot be separated on the map.
EcC2	Edgemont-Chandler channery loams, 10 to 20 percent slopes, moderately eroded.	
EcC3	Edgemont-Chandler channery loams, 10 to 20 percent slopes, severely eroded.	
EcD2	Edgemont-Chandler channery loams, 20 to 35 percent slopes, moderately eroded.	
EcD3	Edgemont-Chandler channery loams, 20 to 35 percent slopes, severely eroded.	
EdC	Edgemont-Chandler very stony loams, 0 to 20 percent slopes.	Well-drained, moderately deep to deep, upland soils developed in residuum from quartzite, quartzose schist, quartzite conglomerate, and highly micaceous schist. The entire profile is gravelly and contains many stones, some boulders, and some outcrops of quartzite, schist, and conglomerate. The surface soil is SC to GC to a depth of about 10 inches. The subsoil is ML or CL to GC from 10 to nearly 40 inches in depth. The substratum is MH or ML to GM down to the bedrock, which lies at a depth of about 4 feet. The water table is very deep. The soil is very strongly acid to extremely acid. The areas of Edgemont stony loam and of Chandler stony loam are not separated on the map.
EdE	Edgemont-Chandler very stony loams, 20 to 60 percent slopes.	
EgA2	Elioak silt loam, 0 to 3 percent slopes, moderately eroded.	Well-drained, deep, upland soils strongly developed in residuum from mica-schist and quartzite. The surface layer to a depth of 6 inches is ML. The subsoil is ML to CL or CL to ML to the bedrock, which is at a depth of 5 feet or more. The water table is very deep. The reaction of the soil is very strongly acid.
EgB2	Elioak silt loam, 3 to 8 percent slopes, moderately eroded.	
EeB2	Elioak gravelly loam, 3 to 8 percent slopes, moderately eroded.	Well-drained, upland soils strongly developed in residuum from mica-schist and quartzite. The profile is somewhat less deep than that of the Elioak silt loams. The entire profile contains 20 percent or more of gravel. The surface layer is ML, and the subsoil is ML to CL or CL to ML to the bedrock. The water table is very deep. The reaction of the soil is very strongly acid.
EeC2	Elioak gravelly loam, 8 to 15 percent slopes, moderately eroded.	
EkA	Elk loam, 0 to 3 percent slopes	Well-drained terrace soils developed on old deposits of alluvium from areas of limestone of various degrees of purity. The soil is ML to a depth of about 20 inches, then CL to the gravelly substratum at a depth of about 36 inches. The substratum is GC, and it contains considerable gravel, cobblestones, or both. The bedrock and the water table are both very deep. The soil is medium acid to strongly acid.
EkB2	Elk loam, 3 to 8 percent slopes, moderately eroded.	
EkC2	Elk loam, 8 to 15 percent slopes, moderately eroded.	
EhB2	Elk gravelly loam, 3 to 8 percent slopes, moderately eroded.	Well-drained terrace soil developed on old deposits of alluvium from areas of limestone of various degrees of purity. The entire profile contains 20 percent or more of rounded, waterworn gravel, mainly chert. The soil is ML to a depth of about 20 inches, then CL to the substratum at a depth of about 36 inches. The GC substratum is very gravelly, very cobbly, or both. The bedrock is very deep, and the water table is also very deep. The soil is medium acid to strongly acid.
FbA	Fauquier loam, 0 to 3 percent slopes	Well-drained, deep, upland soils strongly developed from residuum from schistose metabasalt or greenstone. Most of the soil is MH, but it tends toward ML at the surface and toward CL in the heaviest part of the subsoil, at a depth of about 24 to 40 inches. The bedrock is at a depth of 5 feet or more. The water table is very deep. Most of the soil is medium acid in reaction.
FbB2	Fauquier loam, 3 to 8 percent slopes, moderately eroded.	
FbC2	Fauquier loam, 8 to 15 percent slopes, moderately eroded.	
FdA	Fauquier silt loam, 0 to 3 percent slopes	
FdB2	Fauquier silt loam, 0 to 10 percent slopes, moderately eroded.	
FdC2	Fauquier silt loam, 10 to 20 percent slopes, moderately eroded.	
FdD2	Fauquier silt loam, 20 to 35 percent slopes, moderately eroded.	
FcC2	Fauquier loam, shallow, 8 to 15 percent slopes, moderately eroded.	Well-drained, shallow, upland soils strongly developed in residuum from schistose metabasalt or greenstone. Most of the soil is MH, but it tends toward ML at the surface and CL below. The bedrock is at a depth of about 20 inches. The water table is deep. Most of the soil is medium acid in reaction.
FcE2	Fauquier loam, shallow, 15 to 45 percent slopes, moderately eroded.	

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
FaA FaB2 FaC2 FaD2 FaE3	Fauquier gravelly loam, 0 to 3 percent slopes Fauquier gravelly loam, 3 to 10 percent slopes, moderately eroded. Fauquier gravelly loam, 10 to 20 percent slopes, moderately eroded. Fauquier gravelly loam, 20 to 35 percent slopes, moderately eroded. Fauquier gravelly loam, 20 to 45 percent slopes, severely eroded.	Well-drained, deep, upland soils strongly developed in residuum from schistose metabasalt or greenstone. The entire profile contains from about 15 to 30 percent of gravel, mostly quartzite impurities from the parent material. Most of the soil is MH, but it tends toward ML at the surface and toward CL in the heaviest part of the subsoil, at a depth of about 24 to 40 inches. The bedrock is at a depth of 5 feet or more. The water table is very deep. Most of the soil is medium acid in reaction.
FeC4 FeD3 FeD4	Fauquier silty clay loam, 10 to 20 percent slopes, very severely eroded. Fauquier silty clay loam, 20 to 35 percent slopes, severely eroded. Fauquier silty clay loam, 20 to 45 percent slopes, very severely eroded.	Well-drained, deep, upland soils strongly developed in residuum from schistose metabasalt or greenstone. Most of the surface soil has been lost through erosion. The soil may have some MH left at the surface, but in most places it is CL to bedrock. The bedrock is at a depth of 3 feet or more. The water table is deep. Most of the soil is medium acid in reaction.
FgC2 FgE2	Fauquier very stony loam, 0 to 20 percent slopes, moderately eroded. Fauquier very stony loam, 20 to 50 percent slopes, moderately eroded.	Well-drained, deep, upland soils strongly developed in residuum from schistose metabasalt or greenstone. Most of the soil is MH, but it tends toward ML at the surface and toward CL in the heaviest part of the subsoil, at a depth of about 24 to 40 inches. Stones and boulders are present throughout the profile. The bedrock is at a depth of 5 feet or more. The water table is very deep. Most of the soil is medium acid in reaction.
GaB2 GaC2 GaD2 GaD3 GaE4	Glenelg gravelly loam, 0 to 8 percent slopes, moderately eroded. Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded. Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded. Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded. Glenelg gravelly loam, 15 to 45 percent slopes, very severely eroded.	Well-drained, moderately deep, upland soils developed in residuum from mica-schist and quartzite. These soils are shallower and less strongly developed than the Chester and Elioak soils. The soil throughout the profile contains about 20 percent of quartzite gravel of all sizes. The soil is mostly ML, but it tends toward CL between depths of about 12 and 30 inches and toward MH in the parent material below a depth of 30 inches. The bedrock lies at depths of 4 feet or more. The water table is very deep. The soil is strongly acid.
GbB2 GbC2 GbD2	Glenelg and Chester loams, 3 to 8 percent slopes, moderately eroded. Glenelg and Chester loams, 8 to 15 percent slopes, moderately eroded. Glenelg and Chester loams, 15 to 25 percent slopes, moderately eroded.	Well-drained, moderately deep, upland soils developed in residuum from mica-schist and quartzite. The soil is mostly ML, but it tends toward CL between depths of about 12 and 30 inches and toward MH in the parent material below a depth of about 30 inches. The bedrock lies at depths of 4 feet or more. The water table is very deep. The soil is strongly acid.
GcA2 GcB2 GcC2 GcD2	Glenelg and Chester silt loams, 0 to 3 percent slopes, moderately eroded. Glenelg and Chester silt loams, 3 to 8 percent slopes, moderately eroded. Glenelg and Chester silt loams, 8 to 15 percent slopes, moderately eroded. Glenelg and Chester silt loams, 15 to 45 percent slopes, moderately eroded.	
GdB GdB2	Glenville silt loam, 0 to 8 percent slopes Glenville silt loam, 3 to 8 percent slopes, moderately eroded.	Somewhat poorly drained soils on local colluvium from areas of crystalline rocks, mostly mica-schist. The surface layer to a depth of 10 inches is ML to CL. The subsoil to a depth of nearly 40 inches is CL to ML. The subsoil contains a platy, very slowly permeable fragipan between depths of about 24 and 38 inches. At a depth of about 4 feet, the parent material lies unconformably on bedrock of mica-schist. In some seasons the water table is high, that is, within the fragipan. The soil is medium acid to strongly acid in reaction.
Geb	Glenville very stony silt loam, 0 to 8 percent slopes.	Somewhat poorly drained soils on local colluvium from areas of crystalline rocks, mostly mica-schist. The profile contains numerous stones of schist, quartzite, or both. The surface layer to a depth of 10 inches is ML to CL. The subsoil to a depth of nearly 40 inches is CL to ML. It contains a platy, very slowly permeable fragipan between depths of about 24 and 38 inches. At a depth of about 4 feet, the parent material lies unconformably on bedrock of mica-schist. In some seasons the water table is high, that is, within the fragipan. The soil is medium acid to strongly acid in reaction.
GgA	Guthrie silt loam, 0 to 3 percent slopes	Poorly drained soil on local colluvium from areas of limestone of various degrees of purity. The soil is ML at the surface, but it is CH below a depth of about 10 inches. A very slowly permeable fragipan is present between depths of about 16 and 30 inches, and a very slowly permeable substratum lies below a depth of 30 inches. In some seasons the water table is high, that is, within the fragipan. The soil reaction ranges from medium acid to neutral or mildly alkaline.

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
HbA	Hagerstown loam, 0 to 3 percent slopes	Well-drained, deep, upland soils developed in residuum from fairly pure limestone. The surface of the loam soils is ML in most places; that of the silt loam soils ranges from ML to CL. The subsoil is CH to a depth of about 40 inches. The subsoil is highly plastic, and its clay content is very high. The parent material of disintegrated limestone is MH to CH. In most places it lies on bedrock at a depth of 4 to 6 feet. In some spots the soil is shallow, and hard limestone crops out in some places. The water table is very deep. The soil is normally medium acid to strongly acid to bedrock.
HbB2	Hagerstown loam, 0 to 8 percent slopes, moderately eroded.	
HbC2	Hagerstown loam, 8 to 15 percent slopes, moderately eroded.	
HbD2	Hagerstown loam, 15 to 25 percent slopes, moderately eroded.	
HeA	Hagerstown silt loam, 0 to 3 percent slopes	
HeB2	Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded.	
HeC2	Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded.	
HaA	Hagerstown gravelly loam, 0 to 3 percent slopes	Well-drained, deep, upland soils developed in residuum from limestone. The surface soil is ML, and it contains from 15 to 30 percent of gravel that is mainly chert impurities from the limestone. In some places the subsoil and parent material also contain from 15 to 30 percent of gravel. The highly plastic clay subsoil is CH to a depth of about 40 inches. The parent material of disintegrated limestone is MH to CH. In most places the bedrock lies at a depth of 4 to 6 feet, but some areas contain shallow spots and outcrops of hard limestone. The water table is very deep. The soil is normally medium acid to strongly acid to bedrock.
HaB2	Hagerstown gravelly loam, 3 to 8 percent slopes, moderately eroded.	
HaC2	Hagerstown gravelly loam, 8 to 15 percent slopes, moderately eroded.	
HdB2	Hagerstown rocky loam, 3 to 15 percent slopes, moderately eroded.	Well-drained, upland soil developed in residuum from fairly pure limestone. The surface soil is ML, and the subsoil is CH to a depth of about 40 inches. The subsoil is highly plastic, and its clay content is very high. The parent material of disintegrated limestone is MH to CH. The depth to bedrock ranges from 0 to 4 feet, and there are many outcropping ledges of hard limestone. The water table is very deep. The soil is normally medium acid to strongly acid to bedrock.
HcC3	Hagerstown rocky clay, 8 to 15 percent slopes, severely eroded.	Well-drained, upland soils developed in residuum from fairly pure limestone. The surface soil has been lost through erosion, and all of the remaining soil to bedrock is CH. The depth to bedrock ranges from 0 to 4 feet, and there are many outcropping ledges of hard limestone. The water table is very deep. The soil is normally medium acid to strongly acid to bedrock.
HcD3	Hagerstown rocky clay, 15 to 25 percent slopes, severely eroded.	
HhB2	Highfield silt loam, 0 to 10 percent slopes, moderately eroded.	Well-drained, deep, upland soils developed in residuum from greenstone or metabasalt. These soils are less strongly developed in structure, less plastic, and less red in color than the associated Fauquier soils, and much less well developed than the related Myersville soils. Most of the soil is ML. The subsoil between depths of about 24 and 40 inches approaches CL in texture. Below a depth of 40 inches, the soil is GM and is stony to the bedrock at a depth of 4 feet or more. The water table is very deep. Most of the soil is strongly acid to very strongly acid.
HhC2	Highfield silt loam, 10 to 20 percent slopes, moderately eroded.	
HhD3	Highfield silt loam, 20 to 35 percent slopes, severely eroded.	
HgB2	Highfield channery loam, 0 to 10 percent slopes, moderately eroded.	Well-drained, deep, upland soils developed in residuum from metabasalt. The entire solum contains about 20 to 35 percent of flat fragments of metabasalt. Most of the soil is ML. The subsoil between depths of about 24 and 40 inches approaches CL in texture. Below a depth of 40 inches, the soil is GM. Bedrock lies at a depth of 4 feet or more. The water table is very deep. Most of the soil is strongly acid to very strongly acid.
HgC2	Highfield channery loam, 10 to 20 percent slopes, moderately eroded.	
HgD2	Highfield channery loam, 20 to 35 percent slopes, moderately eroded.	
HgD3	Highfield channery loam, 20 to 35 percent slopes, severely eroded.	
HgD4	Highfield channery loam, 20 to 35 percent slopes, very severely eroded.	
HgE2	Highfield channery loam, 35 to 45 percent slopes, moderately and severely eroded.	
HkC	Highfield very stony loam, 0 to 20 percent slopes	Well-drained, deep, upland soils developed in residuum from metabasalt. The soil contains many stones, some boulders, and outcropping ledges of metabasalt. Most of the soil is ML. The subsoil between depths of about 24 and 40 inches approaches CL in texture. Below a depth of 40 inches, the soil is GM to the bedrock at a depth of 4 feet or more. The water table is very deep. Most of the soil is strongly acid to very strongly acid.
HkE	Highfield very stony loam, 20 to 45 percent slopes.	
HnA	Huntington silt loam, 0 to 3 percent slopes	Well-drained, deep, recent alluvium washed from areas where most of the soils were derived from limestone. The entire profile is ML, but the material below a depth of about 50 inches approaches CL in texture. The surface of the fine sandy loam is SM in some places. In some seasons the water table is high, that is, at 4 to 6 feet in depth. The soil is neutral to slightly acid in reaction.
HoA	Huntington silt loam, local alluvium, 0 to 3 percent slopes.	
HmA	Huntington fine sandy loam, 0 to 3 percent slopes	

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
LaB	Lantz silt loam, 0 to 8 percent slopes	Very poorly drained soil on local colluvium from greenstone, in some places mixed with other rocks. The surface soil is ML. The subsoil is CL from depths of about 10 to 20 inches. A very slowly permeable, gravelly to stony layer lies at depths of about 20 to 36 inches; it has a GC texture. The substratum is also GC, but it has a greater range in texture than the layers above. The water table is near the surface in some seasons. The soil is strongly acid.
LbC	Lantz very stony loam, 0 to 15 percent slopes	Very poorly drained soil on local colluvium from greenstone, mixed with other rocks in some places. The profile contains numerous cobblestones, and boulders. The surface soil is ML. The subsoil is CL between depths of about 10 and 20 inches. A very slowly permeable layer of GC texture lies at depths of from 20 to 36 inches. The substratum is GC, but there is some range in texture. The water table is near the surface in some seasons. The soil is strongly acid.
LdB2	Legore silty clay loam, 0 to 15 percent slopes, moderately eroded.	Well-drained, rather shallow, upland soil developed in residuum from diabase. Most of the profile is CL, but it approaches ML at the surface and CH in the subsoil between depths of about 10 and 24 inches. Bedrock lies at a depth of 4 to 6 feet. The water table is very deep. The surface soil is nearly neutral, but the subsoil is medium acid.
LcB2	Legore gravelly silty clay loam, 0 to 15 percent slopes, moderately eroded.	Well-drained, rather shallow, upland soils developed in residuum from diabase. The entire profile contains 20 percent or more of hard diabase gravel. Most of the profile is CL, but it approaches ML at the surface and CH in the subsoil between depths of about 10 and 24 inches. Bedrock lies at a depth of 4 to 6 feet. The water table is very deep. The surface soil is nearly neutral, but the subsoil is medium acid.
LcD2	Legore gravelly silty clay loam, 15 to 25 percent slopes, moderately eroded.	
LeB	Legore very stony clay loam, 0 to 15 percent slopes.	Well-drained, rather shallow, upland soil developed in residuum from diabase. Stones and boulders of hard diabase are present throughout the profile. The soil is chiefly CL, but it approaches CH in all horizons. Bedrock lies at a depth of 4 to 6 feet. The water table is very deep. The surface soil is nearly neutral, but the subsoil is medium acid.
LeE	Legore very stony clay loam, 15 to 50 percent slopes.	
LgC2	Lehigh slaty loam, 3 to 15 percent slopes, moderately eroded.	Somewhat poorly drained to moderately well drained, upland soils developed in residuum from highly metamorphosed Triassic shale, or porcelanite. The surface texture ranges from GM to GC. From near the surface to a depth of about 1 foot, the soil is CL to GM. From a depth of about 1 foot to 2 feet, the soil is CH to CL, and below that it is GC to bedrock. Bedrock lies at a depth of about 4 feet. The subsoil from a depth of 1 foot down to bedrock is slowly permeable to very slowly permeable. The water table is deep. The soil is strongly acid in reaction, except that, near the diabase dikes that lie next to these soils, the reaction approaches neutral.
LhC4	Lehigh slaty silty clay loam, 3 to 15 percent slopes, very severely eroded.	
LkA	Lindside silt loam, 0 to 3 percent slopes	Somewhat poorly drained, recent alluvium washed from areas where most of the soils were derived from limestone. The soil is ML to a depth of about 30 inches, then CL to ML to a depth of about 44 inches. Some areas have a very slowly permeable CH layer beginning at a depth of about 44 inches, but the local alluvium soils are less likely to have this layer. The water table in some seasons is high, that is, at 2 to 4 feet. The soil is slightly acid to neutral in reaction.
LmA	Lindside silt loam, local alluvium, 0 to 3 percent slopes.	
LmB	Lindside silt loam, local alluvium, 3 to 8 percent slopes.	
LnB2	Linganore channery and gravelly loams, 0 to 15 percent slopes, moderately eroded.	Well-drained to excessively drained, shallow, skeletal, upland soils developed in residuum from hard slaty schist or phyllite. The entire soil is GM, except the subsoil between depths of about 6 and 18 inches, where it is GC. The depths to bedrock range from 1 to 3 feet but average about 2 feet. The water table is very deep. Most of the soil is slightly acid to medium acid.
LnD2	Linganore channery and gravelly loams, 15 to 25 percent slopes, moderately eroded.	
LoB3	Linganore channery and gravelly silt loams, 3 to 15 percent slopes, severely eroded.	Well-drained to excessively drained, very shallow, skeletal, upland soils developed in residuum from hard slaty schist or phyllite. The entire soil is GM, except a layer of subsoil that is GC. The depth of the soil over bedrock averages less than 2 feet, because some of the surface soil has been removed through erosion. The water table is very deep. Most of the soil is slightly acid to medium acid.
LoD3	Linganore channery and gravelly silt loams, 15 to 25 percent slopes, severely and very severely eroded.	
LoE3	Linganore channery and gravelly silt loams, 25 to 55 percent slopes, severely eroded.	
LpC	Linganore very stony loam, 3 to 55 percent slopes	Well-drained to excessively drained, shallow, skeletal, upland soil developed in residuum from hard slaty schist or phyllite. The soil contains many stones and outcrops of hard slaty phyllite and a few of quartzite. The entire soil is GM, except a layer of the subsoil that is GC. The depth of the soil over bedrock averages 2 feet or less. The water table is very deep. Most of the soil is slightly acid to medium acid.

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
MaB2	Manor channery and gravelly loams, 0 to 8 percent slopes, moderately eroded.	Somewhat excessively drained, shallow to very shallow, upland soils developed in residuum from highly micaceous schist and phyllite. The surface soil is SM to GM, and the subsoil is GM to GC to a depth of about 18 inches. The channery parent material is GM. The entire profile is rapidly permeable to very rapidly permeable. Bedrock lies at a depth of 3 to 5 feet. The surface soil is medium acid in reaction, but the rest of the profile is very strongly acid.
MaC2	Manor channery and gravelly loams, 8 to 15 percent slopes, moderately eroded.	
MaC3	Manor channery and gravelly loams, 8 to 15 percent slopes, severely eroded.	
MaD2	Manor channery and gravelly loams, 15 to 25 percent slopes, moderately eroded.	
MaD3	Manor channery and gravelly loams, 15 to 25 percent slopes, severely eroded.	
MaD4	Manor channery and gravelly loams, 15 to 25 percent slopes, very severely eroded.	
MaE3	Manor channery and gravelly loams, 25 to 55 percent slopes, severely and very severely eroded.	
MaE2	Manor channery and gravelly loams, 25 to 45 percent slopes, moderately eroded.	
MbC	Manor very stony loam, 3 to 15 percent slopes	Very shallow, very stony soil that is like the Manor channery and gravelly loams in most of its characteristics. It contains numerous outcrops of hard slaty schist, or loose stones of the same material, or both.
MbE	Manor very stony loam, 15 to 55 percent slopes	
McA	Melvin silt loam, 0 to 3 percent slopes	Poorly drained, recent alluvium washed from areas where most of the soils were derived from limestone. To a depth of about 30 inches, the soil is ML to CL, and then CH to GC to a depth of 4 feet or more. The soil is extremely slowly permeable. Except in the surface layer, the soil is very plastic. In some seasons the water table is near the surface. The reaction of the soil ranges from slightly acid to mildly alkaline.
MdB2	Montalto silty clay loam, 0 to 8 percent slopes, moderately eroded.	Well-drained, deep, upland soils developed in residuum from dikes of diabase. Most of the soil is CL to a depth of about 30 inches, then CH to a depth of about 50 inches. The parent material below this layer is ML, CL, or SC. In most places the bedrock is at a depth of 6 feet or more. The water table is very deep. The solum is medium acid to strongly acid in reaction; the parent material is neutral to slightly acid. These soils differ from Legore soils in being more strongly developed, deeper, and generally finer in texture.
MdC2	Montalto silty clay loam, 8 to 15 percent slopes, moderately eroded.	
MdD2	Montalto silty clay loam, 15 to 25 percent slopes, moderately eroded.	
MeB2	Montalto very stony clay loam, 0 to 15 percent slopes, moderately eroded.	Well-drained, deep, upland soils developed in residuum from dikes of diabase. The soil is CH or nearly CH throughout. The parent material beneath is ML, CL, or SC. The profile contains numerous stones and some boulders of hard diabase. In most places the bedrock is at a depth of 6 feet or more. The water table is very deep. The solum is medium acid to strongly acid in reaction; the parent material is neutral to slightly acid.
MeD	Montalto very stony clay loam, 15 to 45 percent slopes.	
MkA	Myersville and Fauquier loams, 0 to 3 percent slopes.	Well-drained, deep, upland soils developed in residuum from schistose metabasalt. Most of the soil is ML at the surface, then ML to CL to depths of more than 40 inches, then ML to bedrock. Bedrock lies at depths of 5 to 8 feet or more. The water table is very deep. Most of the soil is medium acid, but in a few places it is strongly acid.
MkB2	Myersville and Fauquier loams, 3 to 8 percent slopes, moderately eroded.	
MkC2	Myersville and Fauquier loams, 8 to 15 percent slopes, moderately eroded.	
MkD2	Myersville and Fauquier loams, 15 to 25 percent slopes, moderately eroded.	
MkE2	Myersville and Fauquier loams, 25 to 45 percent slopes, moderately eroded.	
MkE3	Myersville and Fauquier loams, 25 to 50 percent slopes, severely eroded.	
MmA	Myersville and Fauquier silt loams, 0 to 3 percent slopes.	
MmB2	Myersville and Fauquier silt loams, 3 to 8 percent slopes, moderately eroded.	
MmC2	Myersville and Fauquier silt loams, 8 to 15 percent slopes, moderately eroded.	
MmD2	Myersville and Fauquier silt loams, 15 to 25 percent slopes, moderately eroded.	
MhA	Myersville and Fauquier gravelly loams, 0 to 3 percent slopes.	Well-drained, deep, upland soils developed in residuum from schistose metabasalt. The soil contains about 15 to 30 percent of gravel, mostly quartzite impurities from the parent rock. Most of the soil is ML at the surface, then ML to CL to a depth of more than 40 inches, then ML to bedrock. Bedrock lies at depths of 5 to 8 feet or more. The water table is very deep. Most of the soil is medium acid, but in some places it is strongly acid.
MhB2	Myersville and Fauquier gravelly loams, 3 to 8 percent slopes, moderately eroded.	
MhC2	Myersville and Fauquier gravelly loams, 8 to 15 percent slopes, moderately eroded.	

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
MgD4	Myersville and Fauquier clay loams, 15 to 25 percent slopes, very severely eroded.	Well-drained, deep, upland soils developed in residuum from schistose metabasalt. The ML surface soil has been lost through erosion, and the soil is CL or ML to CL down to the parent material, which is ML to bedrock. Bedrock lies at depths of 5 to 8 feet or more. The water table is very deep. Most of the soil is medium acid, but in some places it is strongly acid.
MnC3	Myersville and Fauquier silty clay loams, 8 to 15 percent slopes, severely eroded.	
MoC	Myersville and Fauquier very stony loams, 3 to 35 percent slopes.	Well-drained, deep, upland soils developed in residuum from schistose metabasalt. The soil contains numerous stones. Most of it is ML at the surface, then ML to CL to depths of more than 40 inches, then ML to bedrock. Bedrock of metabasalt, quartzite, or both crops out in a few places but is generally 5 feet or more from the surface. The water table is very deep. Most of the soil is medium acid, but in a few places it is strongly acid.
MoE	Myersville and Fauquier very stony loams, 35 to 50 percent slopes.	
NaA	Norton gravelly silt loam, 0 to 3 percent slopes.	Well-drained, deep, gravelly soils on old colluvial fans; developed from greenstone, sandstone, and quartzite mixed with considerable quantities of Triassic shale and sandstone. Most of the soil is GC, but a concentration of fine materials in the subsoil between depths of about 15 and 50 inches is more nearly CL. The colluvium is very deep over an unconformable layer of Triassic shale and sandstone. The water table is very deep. The soil is normally strongly acid to very strongly acid.
NaB2	Norton gravelly silt loam, 3 to 8 percent slopes, moderately eroded.	
NaC2	Norton gravelly silt loam, 8 to 15 percent slopes, moderately eroded.	
NaD2	Norton gravelly silt loam, 15 to 25 percent slopes, moderately eroded.	
NaE2	Norton gravelly silt loam, 25 to 45 percent slopes, moderately eroded.	
NbB	Norton very stony loam, 3 to 8 percent slopes.	Well-drained, deep, gravelly soil on old colluvial fans. The colluvium consists of greenstone, sandstone, and quartzite mixed with Triassic shale and sandstone, all lying unconformably over Triassic shale and sandstone. The soil contains many stones and a few boulders of sandstone, quartzite, or metabasalt. Most of the soil is GC, but a concentration of fine materials in the subsoil between depths of about 15 and 50 inches is more nearly CL. Bedrock is very deep, and the water table is also very deep. The soil is normally strongly acid to very strongly acid.
PbB2	Penn loam, 0 to 8 percent slopes, moderately eroded.	Well drained to somewhat excessively drained, moderately deep to very shallow, upland soils developed in residuum from Triassic red shale and sandstone. The soil is ML or ML to CL to a depth of about 30 inches. Below 30 inches, it is very shaly GM to GC down to and including the bedrock. The bedrock consists mostly of soft shale. The water table is within the bedrock. The soil is strongly acid to very strongly acid.
PbC2	Penn loam, 8 to 15 percent slopes, moderately eroded.	
PbC3	Penn loam, 8 to 15 percent slopes, severely eroded.	
PbD2	Penn loam, 15 to 25 percent slopes, moderately eroded.	
PeB2	Penn silt loam, 0 to 8 percent slopes, moderately eroded.	
PeB3	Penn silt loam, 3 to 8 percent slopes, severely eroded.	
PeC2	Penn silt loam, 8 to 15 percent slopes, moderately eroded.	
PeC3	Penn silt loam, 8 to 15 percent slopes, severely eroded.	
PhB2	Penn-Lansdale loams, 0 to 8 percent slopes, moderately eroded.	
PhC2	Penn-Lansdale loams, 8 to 15 percent slopes, moderately eroded.	
PhC3	Penn-Lansdale loams, 8 to 15 percent slopes, severely eroded.	
PhD2	Penn-Lansdale loams, 15 to 25 percent slopes, moderately eroded.	
PhD3	Penn-Lansdale loams, 15 to 25 percent slopes, severely eroded.	
PaB2	Penn gravelly loam, 0 to 8 percent slopes, moderately eroded.	Well drained to somewhat excessively drained, moderately deep to very shallow, upland soils developed in residuum from Triassic red shale and sandstone. To a depth of about 30 inches, the soil is ML or ML to CL, and it contains about 20 percent or more of gravel or red Triassic sandstone. A small area of loam in mapping unit PcD3 contains less gravel than the other soils in this group. Below 30 inches, the soil is very shaly GM to GC down to and including the bedrock. The bedrock consists mostly of soft shale. The water table is within the bedrock. The soil is strongly acid to very strongly acid.
PaB3	Penn gravelly loam, 0 to 8 percent slopes, severely eroded.	
PaC2	Penn gravelly loam, 8 to 15 percent slopes, moderately eroded.	
PaC3	Penn gravelly loam, 8 to 15 percent slopes, severely eroded.	
PaD2	Penn gravelly loam, 15 to 25 percent slopes, moderately eroded.	
PcD3	Penn loam and gravelly loam, 15 to 25 percent slopes, severely eroded.	

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
PdB2	Penn shaly loam, 0 to 15 percent slopes, moderately eroded.	Well drained to somewhat excessively drained, shallow to very shallow, upland soils developed in residuum from Triassic red shale and sandstone. The surface layer contains numerous fragments of shale. The soil is SM to GM to a depth of about 3 inches, then ML to GM to a depth of about 14 inches. Below that, it is GM to GC down to and including the bedrock of soft shale. The water table is within the bedrock. The soil is strongly acid to very strongly acid.
PdC3	Penn shaly loam, 3 to 15 percent slopes, severely eroded.	
PdD2	Penn shaly loam, 15 to 25 percent slopes, moderately eroded.	
PdD3	Penn shaly loam, 15 to 25 percent slopes, severely eroded.	
PgB4	Penn soils, 3 to 8 percent slopes, very severely eroded.	Penn loams, silt loams, gravelly loams, and shaly loams, grouped into miscellaneous mapping units. All are very severely eroded, very steep, or both. They are well drained to somewhat excessively drained. They are shallow over soft shale bedrock. The soil consists mostly of the very shaly GM to GC parent material—the upper layers have been lost through erosion.
PgC4	Penn soils, 8 to 15 percent slopes, very severely eroded.	
PgD4	Penn soils, 15 to 25 percent slopes, very severely eroded.	
PgE2	Penn soils, 25 to 50 percent slopes, moderately eroded.	
PgE3	Penn soils, 25 to 50 percent slopes, severely eroded.	
RaA	Raritan silt loam, 0 to 3 percent slopes	Moderately well drained terrace soils on old alluvium that washed from areas of Triassic shale and sandstone. The surface soil to a depth of 6 inches is ML. Below 6 inches, the soil is ML grading to CL; it is CL at a depth of 16 inches. A well-developed, platy, slowly permeable fragipan is present between depths of about 16 and 34 inches. Below the fragipan, the material is mostly waterworn gravel, GM, and extends to considerable depth. In some seasons the water table is high, that is, within the fragipan. The soil is strongly acid.
RaB2	Raritan silt loam, 3 to 8 percent slopes, moderately eroded.	
RbA	Readington silt loam, 0 to 3 percent slopes	Moderately well drained, deep, upland soils strongly developed in residuum from red Triassic shale and some sandstone. The surface soil to a depth of 12 inches is ML or CL. Below a depth of 12 inches, the soil is very slowly permeable CL to a depth of more than 4 feet. The very slowly permeable layer has the effect of a claypan. Both the bedrock and the water table are very deep. Most of the soil material is strongly acid to very strongly acid.
RbB2	Readington silt loam, 0 to 8 percent slopes,, moderately eroded.	
RcA	Roanoke silt loam, moderately deep over cobbles, 0 to 3 percent slopes.	Poorly drained, rather shallow, terrace soil developed on old deposits of alluvium from areas of sandstone, quartzite, and metabasalt. The surface soil to a depth of about 10 inches is ML. The subsoil between depths of about 10 to 24 inches is CL that is very slowly permeable. The gravelly and cobbly substratum, GC, extends to a depth of about 36 inches or more. In some seasons the water table is close to the surface. The soil is neutral to medium acid in reaction.
RdB	Rohrersville silt loam, 0 to 8 percent slopes	Poorly drained soils from upland and colluvial materials. The subsoil developed from residuum from metabasalt. The surface soil developed from local colluvium from metabasalt. The soil to a depth of about 42 inches is ML to CL. Between depths of 12 and 42 inches, it is slowly permeable to very slowly permeable. Below a depth of about 42 inches, the soil is MH. In some seasons the water table is high, that is, at 1 to 3 feet. Most of the soil is medium acid.
RdC2	Rohrersville silt loam, 3 to 15 percent slopes, moderately eroded.	
Re	Rough stony land	Thin, skeletal soils developed from sandstone, quartzite, schist, metabasalt, and various other rocks. These rocks crop out in many places. The soils contain numerous stones and boulders throughout the profile and on the surface. There is very little actual soil; the material is mostly stone.
RgA	Rowland silt loam, 0 to 3 percent slopes	Moderately well drained, recent alluvium that washed from areas of red Triassic shale and sandstone. The upper 12 or 14 inches is ML. Between depths of about 14 and 30 inches, the soil is ML to CL and is very slowly permeable. Below a depth of about 30 inches, the soil is classified as ML to SM. In some seasons the water table is high, that is, at 3 to 4 feet. Most of the soil is very strongly acid, but the substratum is nearly neutral.
SaB2	Sequatchie sandy loam, neutral variant, 3 to 8 percent slopes, moderately eroded.	Excessively drained, shallow to very deep, terrace soils developed in old sandy alluvium deposited over hard sandy limestone. The soil is SM to about 12 inches in depth, then SP to SM to the bedrock. This is the best source of sand in the county. The depth to bedrock ranges from 0 to 6 feet or more. Limestone crops out in a few places. The water table is very deep. The soil reaction is neutral to mildly alkaline.
SaC2	Sequatchie sandy loam, neutral variant, 8 to 15 percent slopes, moderately eroded.	

TABLE 9.—*Soil map units and selected characteristics significant to engineering*—Continued

Map symbol	Name	Selected characteristics significant to engineering
TaB	Thurmont cobbly loam, 0 to 8 percent slopes	Well-drained, gravelly to cobbly soils on old colluvial fans and alluvial terraces; developed from a mixture of metabasalt, sandstone, and quartzite. The surface soil to a depth of 6 inches is ML to GM. Below a depth of 6 inches, and extending to about 4 feet, the material is CL, GM, or GC. Bedrock lies unconformably at great depth. The water table is always deep. The soil is medium acid to very strongly acid.
TcB2	Thurmont gravelly loam, 0 to 8 percent slopes, moderately eroded.	
TcC2	Thurmont gravelly loam, 8 to 15 percent slopes, moderately eroded.	
TcD2	Thurmont gravelly loam, 15 to 25 percent slopes, moderately eroded.	
TbA	Thurmont gravelly and cobbly loams, 0 to 3 percent slopes.	
TdA	Thurmont silt loam, 0 to 3 percent slopes	Well-drained soil on old colluvial fans and alluvial terraces; developed from a mixture of metabasalt, sandstone, and quartzite. The surface soil to a depth of 6 inches is ML to GM. Below a depth of 6 inches, and extending to about 4 feet in depth, the material is CL, GM, or GC. Bedrock lies unconformably at great depth. The water table is always deep. The soil is medium acid to very strongly acid.
TeC	Thurmont very stony loam, 0 to 15 percent slopes.	Well-drained, gravelly to cobbly soil on old colluvial fans and alluvial terraces; developed from a mixture of metabasalt, sandstone, and quartzite. The profile contains many large stones and some boulders of sandstone, quartzite, and metabasalt. The surface soil to a depth of 6 inches is ML to GM. Below a depth of 6 inches, and extending to about 4 feet in depth, the material is CL, GM, or GC. Bedrock lies unconformably at great depth. The water table is always deep. The soil is medium acid to very strongly acid.
UaA	Urbana silt loam, 0 to 3 percent slopes	Somewhat poorly drained to moderately well drained, upland soils developed in residuum from actinolite or sericitic schist. The soil is ML from the surface to a depth of 8 inches, then ML to CL to the bedrock at a depth of about 4 feet. A slowly permeable fragipan is present between depths of about 14 and 22 inches. The water table is in the bedrock most of the time, but in some seasons it is high, that is, in the fragipan. The soil is medium acid.
UaC2	Urbana silt loam, 3 to 15 percent slopes, moderately eroded.	
UaC3	Urbana silt loam, 8 to 15 percent slopes, severely eroded.	
UaD2	Urbana silt loam, 15 to 25 percent slopes, moderately eroded.	
WaB	Watchung silt loam, 0 to 8 percent slopes	Poorly drained to very poorly drained, upland soil developed in residuum from porcelanite or metamorphosed shale and diabase. The surface soil is mostly CL; the lower layers are CH to the bedrock at a depth of about 38 inches. Between depths of about 12 and 38 inches, an extremely slowly permeable, very plastic to extremely plastic, claypan subsoil is present. In some seasons the water table is high, that is, at about 3 feet. Most of the soil is strongly acid, very strongly acid, or extremely acid.
WbB2	Waynesboro gravelly loam, 0 to 8 percent slopes, moderately eroded.	Well-drained, rather deep, terrace soils developed on very old alluvium washed from areas of acid shale and sandstone. The soil is ML at the surface, then ML to CL to a depth of about 17 inches. It is CL to GC from a depth of about 17 inches to 34 inches. From a depth of 34 inches to about 4 feet, the soil is GC to GM. Below a depth of 4 feet the soil material is GW to the rock that lies unconformably at a very deep level. The water table is very deep. The soil reaction is strongly acid.
WbC2	Waynesboro gravelly loam, 8 to 15 percent slopes, moderately eroded.	
WcA	Wehadkee silt loam, 0 to 3 percent slopes	Poorly drained, recent alluvium washed from areas of schist, gneiss, metabasalt, and other crystalline rocks. The soil is ML at the surface and to a depth of about 16 inches. From a depth of 16 inches to 40 inches, it is ML to CL. Below a depth of 40 inches, the material is CH to CL. In a few places, a thin overwash layer of sandy material, SM to SP, lies on the surface. In some seasons the water table is near the surface. The soil is medium acid to strongly acid.
WdB	Worsham silt loam, 0 to 8 percent slopes	Poorly drained soil developed, for the most part, on old local colluvium but partly in residuum from the underlying crystalline rocks, mainly mica-schist. From the surface to a depth of about 8 inches, the soil is ML to CL. Between depths of about 8 inches and 20 inches, the soil consists of a platy fragipan of CL to ML texture. The substratum from depths of 20 to 40 inches or more is CH. It is gleyed and very slowly permeable. The soil reaction is strongly acid.
WeB	Worsham very stony silt loam, 0 to 8 percent slopes.	Poorly drained soil developed mostly in old local colluvium but partly in residuum from the underlying crystalline rocks, mainly mica-schist. The soil contains many stones of schist or quartzite throughout the profile. From the surface to a depth of about 8 inches, the soil is ML to CL. A platy fragipan of CL to ML texture is present between depths of about 8 inches and 20 inches. The substratum from depths of 20 to 40 inches or more is CH; it is gleyed and very slowly permeable. The soil reaction is strongly acid.

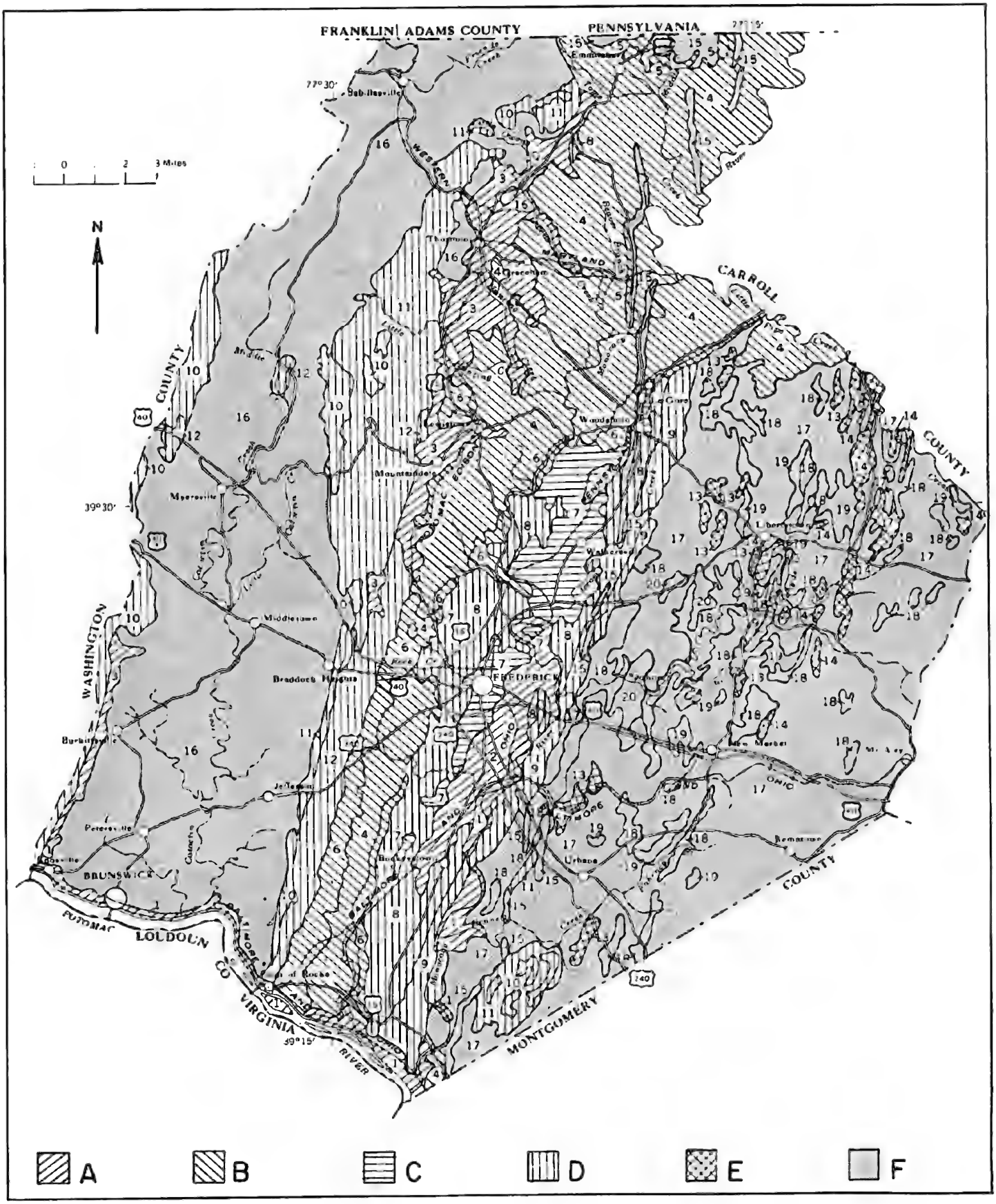

Figure 1.—Parent rocks of the soils of Frederick County (explanation on facing page).

Explanation of figure 1.

A. Alluvial and colluvial sediments on flood plains and lower slopes:
1. Recent and Pleistocene alluvium from various sources.
2. Riverwash sand, thin over highly siliceous Ordovician limestone and dolomite.
3. Material from metabasalt, quartzite, and sandstone in colluvial fans and cones.

B. Shale and some limestone of Triassic age:
4. Soft, red shale and sandstone and gray arkose.
5. Greenish or bluish to purple porcelanite (baked shale).
6. Limestone conglomerate and breccia.

C. Thick Ordovician limestone:
7. Thick, gray and blue-gray limestone and dolomite.

D. Shale, sandstone, and metamorphic rocks of Cambrian age:
8. Thinly bedded limestone and shale, with some chert and calciferous shale.
9. Gray to buff slaty quartzite and gray quartzose phyllite.
10. Light-gray to dark-gray quartzitic sandstone and white quartzite.
11. Mixed quartzitic sandstone, quartzite, and talcose and micaceous phyllitic schist.
12. Talcose, quartzose, and micaceous phyllitic schist.

E. Metamorphic rocks of Lower Cambrian and pre-Cambrian age:
13. Quartzite, quartzose schist, and quartzite conglomerate.
14. Calciferous schist and marble, interbedded with metamorphosed igneous rocks.

F. Igneous and metamorphosed igneous rocks:
15. Diabase in intrusive sills and dikes.
16. Massive and schistose metabasalt, with some metarhyolite.
17. Light-colored soft chloritic and muscovitic phyllitic slate and schist, with many quartzite injections.
18. Hard, blue to purple, slaty and phyllitic meta-andesite and metarhyolite.
19. Gray, blue, green, and violet actinolite or sericitic schist.
20. Gneiss, with many quartzite injections.

color, are omitted, except in a few instances where they are needed to distinguish otherwise similar soils.

Soil Formation and Classification

Soils are mixtures of fragmented and partly or completely weathered rocks and minerals with organic matter, water, and air in greatly varying proportions. They are produced by the action of the soil-forming processes on materials deposited or accumulated by geologic agencies. The important factors in development of soils are the parent materials, the climate, the relief or lay of the land, the biological forces, and time. The kind of soil that develops in any given environment depends on the interaction of these five factors.

Soil Formation in Frederick County

The effects of the chief soil-forming factors in Frederick County will be considered separately here. Some, like climate and vegetation, are important but relatively uniform over the county. Others, like parent material and relief, vary enough to cause important differences in the soils.

Parent material

The parent materials of the soils in Frederick County can be considered in two broad classes. The first consists of materials that resulted from the weathering of rocks in place. The second consists of materials transported by water, gravity, or both, and deposited in various combinations.

Igneous and metamorphosed igneous rocks occupy most of the county. Igneous rocks were formed by hardening of molten masses of primary rock materials. The only unaltered igneous rocks in the county are diabase, which occurs in the extreme northern part of the county and in long narrow dikes and ridges south of that area.

Igneous rocks that have been metamorphosed, or altered, by heat, pressure, or earth movements are the most extensive group of rocks in the county. They include the massive or schistose metabasalt or greenstone that dominates in the western third of the county. They also include the gneiss and meta-igneous schist that dominate in the eastern third of the county.

The central third of the county is dominated by sedimentary rocks. They formed from fine to coarse materials laid down in water and subsequently transformed into rock through compaction, cementation, and chemical processes. The unaltered sedimentary rocks of this county are sandstone, shale, limestone, conglomerate, and breccia. In some areas these rocks have been metamorphosed by heat, pressure, and earth movements into quartzite, slate, porcelanite, marble, and schist.

The unconsolidated masses of rock and soil materials that occupy broad colluvial foot slopes of mountains and present and former flood plains of streams are parent materials of some of the soils of the county. These materials are transported and in most places form a fairly thin mantle over bedrock of different geologic origin. Where they occur, however, they are more important to the soils than the bedrock below.

Figure 1 shows the parent rocks from which the soils of Frederick County have developed. Of the alluvial and colluvial materials, only the larger areas are shown, because these materials generally occur in small spots and strips that cannot be shown on a map of this scale.

Climate

Frederick County has a rather humid temperate climate, which is fairly uniform over the county. On Catoctin Mountain, South Mountain, and at other high elevations, the climate is somewhat cooler than in the rest of the county, and more precipitation falls, particularly as snow. Basically, however, there is not enough difference in climate within the county to account for the differences in soils.

Plant and animal life

The native vegetation varies so little throughout Frederick County that its effects cannot explain the differences in the soils. Mixed hardwood forests are native to practically all of this county. Oak is dominant in these forests. Other important trees are hickory, maple, elm, dogwood, and other hardwoods. A few localities have some evergreens, such as short-

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leaf pine, white pine, or hemlock. Chestnut trees were probably common at one time, but they have disappeared.

Most hardwood species feed heavily on calcium and other bases from the soil. In large proportion, these bases are returned to the soil each year in the falling leaves. This return of bases counteracts the tendency for the soil to lose its bases through leaching.

Specific data on the micro-organisms, earthworms, larvae, and other members of the soil population are not available, but it is unlikely that there are differences significant to the development of different soils in the county.

Relief

The relief in this county ranges from nearly level to very steep. The differences in slope have a strong influence on the kind of soil that can develop from a given parent material. This influence can be illustrated by comparing different soils that develop on red Triassic shale in the Piedmont Plateau part of the county.

Where the topography is fairly smooth and undulating and the slopes are not strong enough for rapid runoff, nor near enough level to keep water standing, a deep and well-drained soil will develop after sufficient time. Examples of such soils in Frederick County are the Bucks soils.

If the slope is steep enough, the materials developed by soil-forming processes will be removed by natural processes almost as rapidly as they form. A somewhat excessively drained, shallow soil that contains unweathered shale fragments will develop. The Penn soils are of this description.

If the topography is so nearly level that little water runs off, a large part of the precipitation will percolate down through the soil. This water carries with it the clay that has been formed by the weathering processes and deposits it at a lower depth in the soil, filling up the spaces between soil granules. In such a soil, a claypan is developed, and the soil is only moderately well drained to somewhat poorly drained. The Readington soils are an example of this in Frederick County.

If there is a slight depression in the topography, silt as well as clay will accumulate in the subsoil, and other soil material will wash in from surrounding areas and accumulate on the surface. The soil will be poorly drained. This kind of soil development is represented in Frederick County by the Croton soil.

If the depression in topography is so pronounced that the area is somewhat ponded in wet seasons and very little water drains from the surface, the vegetation will be dominantly water-loving plants. As these plants decay only partly without good aeration, organic matter will accumulate in the soil. The soil will be very poorly drained. Only insignificant spots of such soil occur in Frederick County. They belong to the Stanton series, but the areas are so small that no mapping units of this soil are separated on the map or described in the report. The areas are marked as wet spots within units of the Croton soil.

Variations that correspond to the above are likely to develop on each of the various parent materials of the county, according to the differences in relief.

Time

The length of time that the soil material has been developing affects the kind of soil that develops from it. An older or more strongly developed soil shows well-defined genetic horizons. A less well developed soil shows only weakly developed horizons or none.

Some of the alluvial and colluvial materials have not been in place long enough for the climate and vegetation to develop well-defined genetic horizons in the profile. Most soils on flood plains are weakly developed for this reason.

In steep areas, soil material is removed before it has had time to develop into a deep soil profile. Even though the soil has been developing for a long time, it is still immature because none of the material stays long enough after it weathers from the rock to develop completely as a soil.

Soil Classification in Frederick County

The soils in this county are classified as Gray-Brown Podzolic soils, Sols Bruns Acides, Red-Yellow Podzolic soils, Planosols, Low-Humic Gley soils, Lithosols, and Alluvial soils (*7*). Some soils have characteristics of more than one of these great soil groups. Such soils are classified in one group but intergrade toward another. Thus, in Frederick County, there are Gray-Brown Podzolic soils that intergrade toward the Red-Yellow Podzolic soils, the Planosols, the Low-Humic Gley soils, or the Lithosols. Some of the Red-Yellow Podzolic soils intergrade toward the Reddish-Brown Lateritic soils, the Planosols, or the Low-Humic Gley soils.

Each soil series within these great soil groups and their intergrades has developed from a particular kind of parent material on a characteristic kind of topography. Table 10 shows how the topography, relief, and parent materials are related to the classification of the soils of the county.

Gray-Brown Podzolic soils

There are 27 series in the Gray-Brown Podzolic group in this county. Two of them, the Athol and Duffield series, are typical of the group; the others intergrade toward other groups.

A typical Gray-Brown Podzolic soil has a moderately thick or thick solum consisting of a layer of organic matter and layers of mixed organic and mineral material over a leached horizon above an illuvial horizon. The organic matter is a thin layer of leaf litter lying on a thin layer of dark-colored humus that is somewhat mixed with mineral soil. Underneath this is the leached, or A_2, horizon, which is somewhat thicker and lighter colored—mostly gray or grayish brown—and has a granular structure. The B horizon generally has somewhat darker and stronger colors, is finer textured, and has a blocky or subangular blocky structure.

Soils that have characteristics of both the Gray-Brown Podzolic and Red-Yellow Podzolic groups are those of the Birdsboro, Bucks, Cardiff, Chester, Cly-

TABLE 10.—*Classification of soils in Frederick County, Md., and topography, relief, and parent material*

Great soil group and series	Topography	Relief	Parent rocks
Gray-Brown Podzolic soils (Central concept):			
Athol	Uplands	Undulating	Limestone breccia and conglomerate.
Duffield	Uplands	Undulating to rolling	Thinly bedded limestone and shale.
Gray-Brown Podzolic soils (Intergrade toward Red-Yellow Podzolic soils):			
Birdsboro	Terraces	Undulating	Sediments from Triassic rocks.
Bucks	Uplands	Undulating	Red Triassic shale.
Cardiff	Uplands	Rolling to hilly	Slaty quartzite.
Chester	Uplands	Undulating to rolling	Micaceous schist.
Clymer	Uplands	Undulating to hilly	Quartzitic sandstone.
Conestoga	Uplands	Rolling	Calciferous schist.
Edgemont	Uplands	Rolling to hilly	Quartzose schist and quartz conglomerate.
Elk	Terraces	Undulating	Sediments from limestone.
Frankstown	Uplands	Undulating to rolling	Cherty and shaly limestone.
Glenelg	Uplands	Undulating to rolling	Quartzitic micaceous schist.
Glenville	Uplands	Undulating to depressed	Micaceous schist.
Hagerstown	Uplands	Undulating	Fairly pure limestone.
Highfield	Uplands	Rolling to mountainous	Metabasalt.
Lansdale	Uplands	Undulating	Light-colored Triassic shale and sandstone.
Myersville	Uplands	Undulating to rolling	Metabasalt.
Norton	Colluvial fans and cones	Undulating to rolling	Debris from metabasalt and Triassic rocks.
Readington	Uplands	Gently sloping	Red Triassic shale and sandstone.
Sequatchie[1]	Terraces	Undulating	Sandy sediments on siliceous limestone.
Gray-Brown Podzolic soils (Intergrade toward Planosols):			
Chalfont	Uplands	Undulating to rolling	Light-colored Triassic shale.
Lehigh	Uplands	Undulating	Porcelanite.
Raritan	Terraces	Undulating	Sediments from Triassic rocks.
Gray-Brown Podzolic soils (Intergrade toward Low-Humic Gley soils):			
Urbana	Uplands	Undulating to rolling	Actinolitic schist.
Gray-Brown Podzolic soils (Intergrade toward Lithosols):			
Legore	Uplands	Rolling	Diabase.
Linganore	Uplands	Rolling to hilly	Dark phyllitic schist.
Penn	Uplands	Undulating to rolling	Red Triassic shale and sandstone.
Sols Bruns Acides (Central concept):			
Dekalb	Uplands	Rolling to mountainous	Quartzitic sandstone.
Manor	Uplands	Rolling	Micaceous schist.
Red-Yellow Podzolic soils (Central concept):			
Braddock	Colluvial fans and cones	Undulating to rolling	Debris from metabasalt.
Elioak	Uplands	Undulating to rolling	Micaceous schist.
Thurmont	Colluvial fans and cones	Undulating to rolling	Debris from metabasalt and quartzite.
Waynesboro	Terraces	Undulating to hilly	Sediments from light acidic rocks.
Red-Yellow Podzolic soils (Intergrade toward Reddish-Brown Lateritic soils):			
Fauquier	Uplands	Undulating to rolling	Metabasalt.
Montalto	Uplands	Undulating to rolling	Diabase.
Red-Yellow Podzolic soils (Intergrade toward Planosols):			
Captina	Terraces	Undulating	Sediments from limestone.

TABLE 10.—*Classification of soils in Frederick County, Md., and topography, relief, and parent material*—Continued

Great soil group and series	Topography	Relief	Parent rocks
Red-Yellow Podzolic soils (Intergrade toward Low-Humic Gley):			
Augusta	Terraces and colluvial fans	Undulating	Debris from metabasalt and quartzite.
Colbert[2]	Uplands	Nearly level	Limestone.
Planosols (Central concept):			
Croton	Uplands	Level to depressed	Triassic shale and sandstone.
Guthrie	Uplands	Level to depressed	Limestone.
Rohrersville	Uplands	Depressed	Metabasalt.
Watchung	Uplands	Level to depressed	Porcelanite and diabase.
Low-Humic Gley soils (Central concept):			
Lantz	Uplands	Depressed	Metabasalt and quartzite.
Roanoke	Terraces and fans	Level to undulating	Debris from metabasalt and quartzite.
Worsham	Uplands	Depressed	Micaceous schist.
Low-Humic Gley soils (Intergrade toward Alluvial soils):			
Bowmansville	Flood plains	Almost level	Sediments from Triassic rocks.
Melvin	Flood plains	Almost level	Sediments from limestone.
Wehadkee	Flood plains	Almost level	Sediments from light acidic rocks.
Lithosols (Central concept):			
Brandywine	Uplands	Rolling to hilly	Gneiss.
Catoctin	Uplands	Rolling to hilly	Metabasalt.
Chandler	Uplands	Undulating to hilly	Highly micaceous phyllitic schist.
Talladega	Uplands	Undulating to hilly	Highly micaceous phyllitic schist.
Alluvial soils (Central concept):			
Bermudian	Flood plains	Almost level	Sediments from Triassic rocks.
Chewacla[3]	Flood plains	Almost level	Sediments from light acidic rocks.
Congaree	Flood plains	Almost level	Sediments from light acidic rocks.
Huntington	Flood plains	Almost level	Sediments from limestone.
Lindside[3]	Flood plains	Almost level	Sediments from limestone.
Rowland[3]	Flood plains	Almost level	Sediments from Triassic rocks.

[1] In Frederick County, this soil is not typical of the Sequatchie series, which is in the Red-Yellow Podzolic group.

[2] There are only a few acres of this soil in Frederick County. It is not typical of the Colbert series, which is a Lithosol intergrading toward the Red-Yellow Podzolic soils.

[3] These soils are only moderately well drained. They are beginning to intergrade toward Low-Humic Gley soils.

mer, Conestoga, Edgemont, Elk, Frankstown, Glenelg, Glenville, Hagerstown, Highfield, Lansdale, Myersville, Norton, Readington, and Sequatchie series. These soils are like the Gray-Brown Podzolic soils in depth of solum, sequence of horizons, degree of textural development, and color, although some have more brightly colored B horizons. In other properties, such as the low degree of base saturation and small remaining amounts of the easily weathered minerals, they resemble the Red-Yellow Podzolic soils. The Glenville and Readington soils have a firm or very firm layer of silty clay loam or clay that impedes the flow of water and the penetration of roots.

The Chalfont, Lehigh, and Raritan series in this county are Gray-Brown Podzolic soils intergrading to Planosols. They are generally similar to the Gray-Brown Podzolic soils, but they have a plastic or tough B horizon that is fine textured or moderately fine textured. The B horizon is distinctly finer than the A horizon, but the change in texture is not so abrupt as in Planosols. The B horizon impedes root penetration and moisture movement in these soils, which are not well drained.

The Gray-Brown Podzolic soils intergrading to Low-Humic Gley soils in this county are in the Urbana series. These soils are characterized by a fragipan horizon below a normal B horizon. This fragipan is dense, compact, very silty, and platy in structure. It is slowly to very slowly permeable to water, and it obstructs the development of roots.

The lower part of the B horizon is not so intensely colored as in the Gray-Brown Podzolic soils, but it is more highly mottled. The soils are only moderately well drained.

Gray-Brown Podzolic soils intergrading to Lithosols in this county are the Legore, Linganore, and Penn soils. Generally, these are like the Gray-Brown Podzolic soils. Like Lithosols, however, they are shallow or moderately shallow over bedrock and may contain large amounts of coarse fragments. Where they are only moderately shallow, coarse fragments make up nearly all of the loose material to within a few inches

of the surface. Unlike Lithosols, these soils have a textural B horizon.

Sols Bruns Acides

The Dekalb and Manor soils are the only typical Sols Bruns Acides, or Acid Brown Earths, in Frederick County. Some of the Red-Yellow Podzolic soils show a few of the characteristics of the Sols Bruns Acides.

The typical Sol Brun Acide has a weak, thin A_1 horizon. The A_2 horizon is very weak and thin, or it may be absent or nearly so. The B horizon is differentiated almost entirely by its brownish color. It shows little differentiation in structural development, and it contains few clay coats. Its clay content is never more than slightly higher than that of the horizons above and below. These soils have a low degree of base saturation. Most of them are very strongly acid, but a few are only medium acid or strongly acid.

Under forest, the Dekalb soils have a layer of scattered hardwood leaves and some pine needles, and then a thin layer of decomposed leaf mold over the upper mineral, or A_1, horizon. The thickness of the major BC horizon averages between 15 and 20 inches, but it may be as much as 30 or as little as 6 inches.

The Dekalb soils are somewhat excessively drained. They tend to be droughty. They are open and porous, and they are seldom very wet. Their moisture-supplying capacity is very low.

Red-Yellow Podzolic soils

The Red-Yellow Podzolic group in this county contains 9 series. Of these, 4 represent the central concept; the remaining 5 have characteristics of other great soil groups. Those that are well within the Red-Yellow Podzolic group are the Braddock, Elioak, Thurmont, and Waynesboro soils.

The typical Red-Yellow Podzolic soil is well developed, well drained, and medium to strongly acid. Its moisture-supplying capacity is moderate to high. The solum, or A and B horizons of the profile, is moderately thick to very thick. The soil has a thin, gray to dark-gray A_1 horizon of mixed organic and mineral matter. The thick, light-colored A_2 horizon shows the effect of leaching and is bleached in appearance.

The B horizon is red, yellowish red, or yellow in color and much finer in texture than the horizon above. The chroma in the B horizon is 6 or more in most places.

The base saturation in the B horizon is normally less than 35 percent and decreases with depth. If lime has recently been added to the soil, the base saturation of the surface layer and the upper B horizon may be more than 35 percent. Most of the parent materials, but not all, are more or less siliceous. Many of the thicker layers of parent material are mottled, marbled, or otherwise variegated.

The Fauquier and Montalto are Red-Yellow Podzolic soils intergrading to the Reddish-Brown Lateritic group. They have browner A horizons than typical Red-Yellow Podzolic soils. The B horizons are dark red or red. The A horizons, however, are not so dark as those of true Reddish-Brown Lateritic soils.

The Captina soils are Red-Yellow Podzolic soils intergrading to Planosols. These are moderately well drained soils that have an evident fragipan in the lower part of the solum. The upper part of the B horizon is dominantly yellowish brown. The fragipan is at a depth of 34 inches. It consists of strong-brown silty clay to sandy clay mottled with light brownish gray. It is very hard when dry and firm and brittle when moist. It impedes moisture movement and root penetration.

Red-Yellow Podzolic soils intergrading to the Low-Humic Gley soils are represented by the Augusta and Colbert soils in this county. The normal soil of the Colbert series is a Regosol, but the variant in this county is deeper than the typical Colbert soil. It is like a Red-Yellow Podzolic soil in having a textural profile. It is somewhat poorly drained, and the morphologic characteristics that have resulted from wetness and gleying are like those of the Low-Humic Gley soils.

Planosols

The Planosols are represented in this county by the Croton, Guthrie, Rohrersville, and Watchung series. All of these represent the central concept. Planosols have an eluviated surface horizon underlain by a well developed to moderately well developed illuvial, or B, horizon that has a distinctly higher percentage of clay than the layers above. Planosols are characterized chiefly by one or more horizons abruptly separated from and sharply contrasting with adjacent horizons because of cementation, compaction, or high clay content. These layers may be part of the B horizon or may lie below the solum (*7*).

Low-Humic Gley soils

Low-Humic Gley soils in this county are members of the Bowmansville, Lantz, Melvin, Roanoke, Wehadkee, and Worsham series. The Lantz, Roanoke, and Worsham soils represent the central concept of this great soil group.

The typical Low-Humic Gley soil is poorly drained. It is characterized by a dark, in most places thin, surface horizon that is moderately high in organic-matter content. In many places fine material washed in from nearby higher soils has accumulated on the surface.

Illuviation, or washing of fine materials down into the subsoil, is moderate. The subsoil does not contain so much organic matter as the surface soil. In most places the surface layers are coarser textured than the underlying horizons.

Gleization, or reduction of iron due to waterlogging and lack of oxygen, is rather strong in the subsoil. The partial gleization gives the subsoil a mottled appearance. The soil is medium acid to strongly acid or even extremely acid in reaction.

The soils in this great soil group are poorly drained and, therefore, are wet much of the time. They have little or no development of a fragipan, but they are poorly drained because of their fine-textured B horizon or a high water table.

The slow permeability does not allow much water to soak into the soil. It also retards the upward movement of water from lower depths in dry weather.

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The Bowmansville, Melvin, and Wehadkee soils, which developed on flood plains, are intergrades toward Alluvial soils. They are flooded fairly often, and water sometimes stands on them for a long time.

Lithosols

The Lithosols in this county are members of the Brandywine, Catoctin, Chandler, and Talladega series. They are shallow soils that have no clearly expressed soil morphology. The typical Lithosol consists mostly of a freshly weathered mass of rock fragments.

The Talladega soils have a very thin, dark-brown, mixed organic and mineral soil layer, and a thin, strong-brown, medium-textured, transitional layer over yellowish-red stony loam to silt loam parent material, which lies over partly decomposed mica-schist at a depth of 20 inches.

Alluvial soils

The typical Alluvial soil shows little or no genetic profile development. Such soils in Frederick County belong to the Bermudian, Chewacla, Congaree, Huntington, Lindside, and Rowland series. These soils vary considerably in texture, thickness, permeability, color, and other properties.

The Bermudian, Congaree, and Huntington are important soils on the flood plains of the major streams. They are deep and well drained. They have practically no differences between horizons. Their moisture-supplying capacity is high.

The Chewacla, Lindside, and Rowland soils are only moderately well drained. Most of the time their water table is higher than that of the well-drained soils, and they are flooded more often by stream overflow. They show some evidence of slight gleization of the lower subsoil.

General Information About Frederick County

Frederick County is in the northwestern part of Maryland, next to Pennsylvania and Virginia, and very near to West Virginia (fig. 2). The total area is 664 square miles, or 424,960 acres, excluding the water surface area of the Potomac River. This river, where it forms the boundary between Virginia and Frederick County, is politically a part of Frederick County.

The most southern point in Frederick County is at the confluence of the Monocacy and Potomac Rivers. The Potomac River, the southwestern boundary, separates the county from the State of Virginia. The

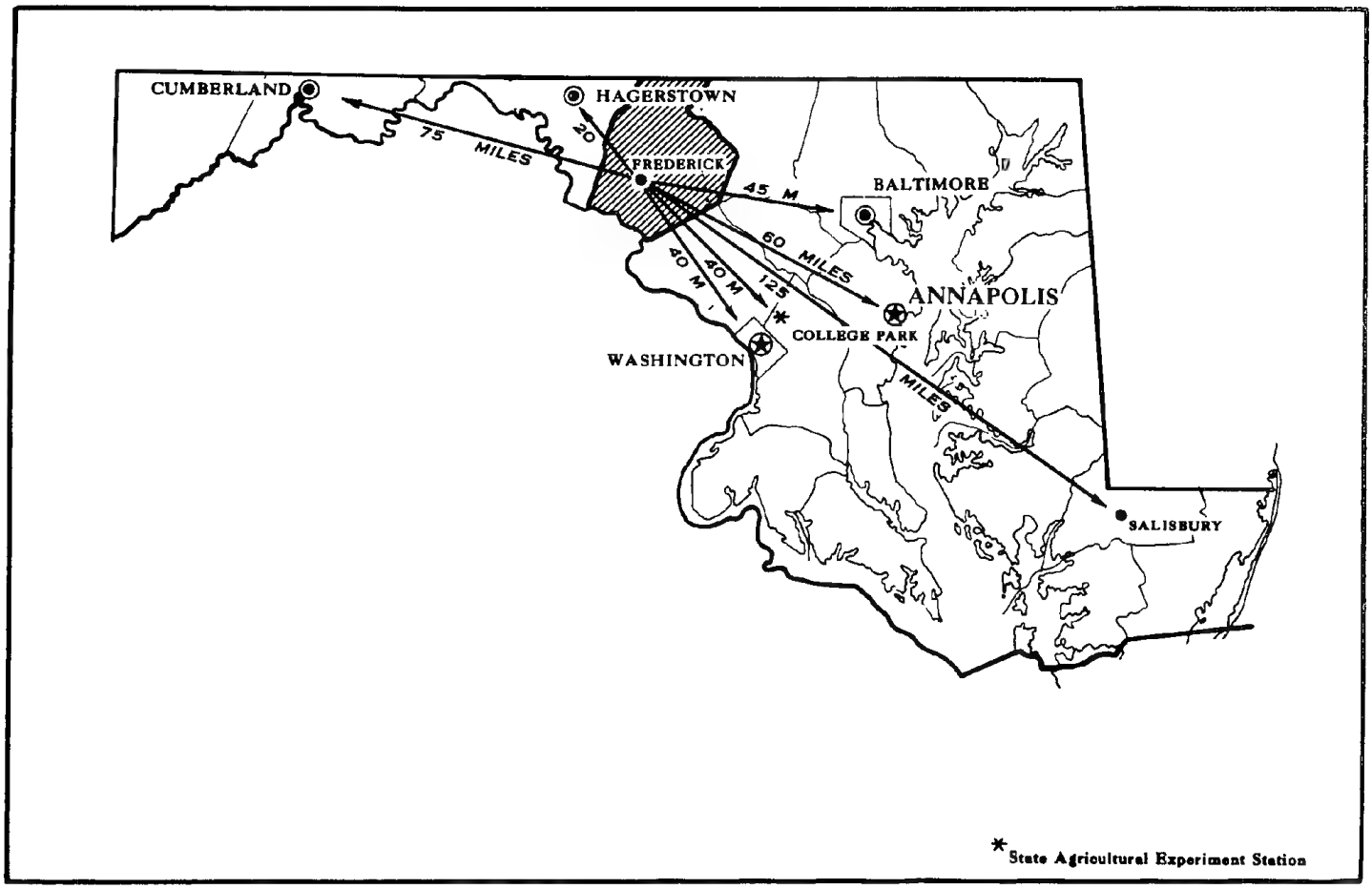

Figure 2.—Location of Frederick County in Maryland.

western boundary is Washington County, Maryland. Along the northern side of the county runs the Pennsylvania State line. Carroll County bounds Frederick County on the east, and Montgomery County is the boundary on the southeast.

Frederick County is divided into 20 townships or election districts. Frederick, the principal town and the county seat, is located just south of the center of the county. It is about 50 miles west of Baltimore, Md., and about 50 miles northwest of Washington, D. C. In a limited sense, Frederick County is suburban to the large cities of Baltimore and Washington. A growing number of the county's population commute to these two cities daily for business or professional purposes.

Settlement and Population

Frederick County was part of the original grant of land to Lord Baltimore. In 1730 it was opened to settlement. The first settlers were mostly English from Maryland and Virginia. They settled in the limestone area known as Frederick Valley. In 1733 and through the next 15 years, many Germans and some Scotch-Irish from Pennsylvania settled along the Monocacy River. Later, many Irish and German immigrants came directly to Frederick County from Europe (*4*).

Frederick County was established in 1748. It was originally much larger than it is now. It was reduced in area several times, and finally, in 1836, to its present boundaries.

The population of Frederick County in 1955 was 65,107. This is an increase of 4.5 percent over the population in 1950, and of 23.9 percent over the population in 1920. Most of the increase since 1940 has been in the city of Frederick.

The city of Frederick was first laid out in 1745, before the county was established. It had a population of 18,142 in 1950. Other principal towns of the county and their population are: Brunswick, 3,752; Thurmont, 1,676; Emmitsburg, 1,261; Middletown, 936; Walkersville, 761; Woodsboro, 427; Point of Rocks, 361; New Market, 301; Myersville, 250; and Burkittsville, 190. More than a hundred other named communities and villages are scattered through the county.

Physiography

Three major physiographic provinces cross Frederick County in a general north and south direction, but tending slightly toward northeast to southwest. They continue on into Pennsylvania in the north and into Virginia in the south (*5*).

The Piedmont Plateau lies in the eastern and southeastern part of the county. The Limestone Valley and the Triassic Plain are located in the center. The easternmost low ranges of the Appalachian Mountains, with their intermountain valleys, lie in the western part of the county.

The Piedmont Plateau is an old peneplain that has been completely dissected by many small streams. It is composed mainly of schistose metamorphic rocks of both sedimentary and igneous origin. It is rolling in relief. Elevations range from a little more than 400 feet in the southern part to more than 700 feet in the eastern part of the county. Near the Montgomery County line in the south, one of the Piedmont ridges culminates in a peak called Sugarloaf Mountain, with an elevation of 1,280 feet (*5*).

The troughlike central part of the county is made up of a shallow limestone valley in the southern part and a low Triassic upland plain in the northern part. Elevations in the Frederick Valley, underlain by limestone, are between 300 and 400 feet. In the Triassic plain to the north, elevations rise to about 500 feet.

Two low ranges of the Appalachian Mountains cross Frederick County. South Mountain runs along the Washington County line. Its highest point within Frederick County is Lambs Knoll, at an elevation of 1,772 feet. Catoctin Mountain runs from the Potomac River northward within the county. Its maximum elevation is 1,917 feet.

Between these two mountain ranges, the drainage is southward toward the Potomac River. The lower part of the drainage area is a rugged intermountain valley known as Middletown Valley, or more rarely as the Catoctin Valley. The valley itself begins at about 1,000 feet elevation near Ellerton and falls to an elevation of slightly less than 500 feet in the southern part.

The mountains are formed of sedimentary and metamorphosed sedimentary and igneous rocks, but the intermountain valley is composed almost entirely of a green schistose rock, which is a metamorphosed basalt.

Water Supply

This county is well drained. There are no swamps, and poorly drained soils occupy only a few small spots. Some upland flats, mostly within the Triassic areas, do not have good drainage in some places, especially around the heads of drainageways that have developed no channels.

All of Frederick County lies within the drainage basin of the Potomac River. Practically all of the county east of Catoctin Mountain is drained by the Monocacy River, which is the largest tributary of the Potomac in this general area. The part of the county north of the Catoctin Recreational Demonstration Area also reaches the Monocacy River by means of Friends Creek, which drains into Toms Creek, a tributary of the Monocacy River. Most of that part of the county west of Catoctin Mountain and south of the Catoctin Recreational Demonstration Area is drained directly to the Potomac by Catoctin Creek. Tuscarora Creek and one of the streams known as Little Catoctin Creek are smaller creeks that flow from this area into the Potomac without entering the Monocacy River or Catoctin Creek.

Frederick County has an ample supply of surface water for all of its domestic and commercial uses, provided that it can be stored until it is needed. The runoff from each acre averages more than 700 gallons of water per day. The amount of water that can be stored underground depends on the porosity of the

underlying rocks. The porosity, or water-holding capacity, of the rocks is generally low in Frederick County (*5*). During long dry periods the water table may fall so low that shallow wells may be dry, and the yield from other wells and springs may be considerably reduced.

In the mountainous part of Frederick County, springs usually discharge only a few gallons of water per minute. This is because a large proportion of the rainfall runs off. The basaltic rocks and quartzites of the area have relatively few fractures or joints, which do not extend to any great depth. These rocks decrease rapidly in storage capacity with depth, and it is not generally considered practical to drill wells deeper than 300 feet. Wells between 100 and 200 feet deep usually yield an average of 5 to 10 gallons per minute. Higher yields have been reported, particularly from the area near Brunswick.

Most wells in the areas underlain by red Triassic shale and sandstone are less than 200 feet deep. Most of them yield from 2 to 20 gallons per minute, but a few wells produce from 50 to 100 gallons per minute. These Triassic rocks have many fractures and joints, and this enables them to store and distribute somewhat more water than some of the denser rocks do.

The probability of a dry well in the Triassic area is small. There are not many active springs in this area, but many small seep spots are used as sources of stock water.

In the limestone areas of the Frederick Valley, yields from wells and springs vary considerably. Most of them yield more water than is obtained in other parts of the county. Yields of more than 50 gallons per minute are fairly common, and a yield of 125 gallons per minute has been reported for one well. These rocks probably have more and larger openings and channels than other rock, because of natural solution of the limestone itself. Most of the wells in this area are less than 100 feet deep.

There are many springs in the Piedmont Plateau area, but most of them discharge only a few gallons per minute. Most wells are less than 100 feet deep, and most of them furnish between 2 and 20 gallons per minute. Of 140 wells reported in this area, only 10 had yields of more than 50 gallons per minute (*5*).

Most of the communities in Frederick County obtain their water from wells, but Thurmont, Walkersville, Emmitsburg, and Frederick get most of their water from surface catchment areas. The largest of these is the City of Frederick Municipal Forest, located on Catoctin Mountain west of Mountaindale. The runoff from this well-protected watershed area is collected and stored in the Fishing Creek Reservoir. An auxiliary water supply for Frederick comes from Linganore Creek, through the Linganore filtration plant.

Climate

Frederick County has a humid, temperate, continental climate. Summers are short and rather warm. Winters are rigorous but not severe. Climatic data for the official weather station in the city of Frederick is summarized in table 11. These data are fairly representative of the climate of the rest of the county. On the mountains the average temperatures are slightly lower and a little more snow falls than in the valleys.

TABLE 11.—*Temperature and precipitation at Frederick Police Barracks,*[1] *Frederick County, Maryland*

[Elevation, 380 feet]

Month	Temperature[2]			Precipitation[3]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1930)[1]	Wettest year (1948)	Average snowfall
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	34.8	72	−19	30.6	3.57	6.12	4.5
January	32.4	76	−21	31.5	1.98	4.63	7.2
February	33.3	80	−12	28.6	1.81	1.68	7.6
Winter	33.5	80	−21	90.7	7.36	12.43	19.3
March	42.6	90	0	33.7	2.26	3.87	4.7
April	52.8	98	13	35.2	2.87	5.24	.6
May	63.7	100	24	37.7	1.10	6.27	(4)
Spring	53.0	100	0	10.66	6.23	15.38	5.3
June	72.1	104	38	4.21	2.67	4.77	0
July	76.5	109	42	3.91	.22	4.02	0
August	74.1	106	39	3.87	1.26	6.02	0
Summer	74.2	109	38	11.99	4.15	14.81	0
September	67.7	102	28	3.36	.58	2.04	0
October	55.9	99	22	2.94	.44	3.61	.1
November	44.5	84	4	2.67	1.08	4.89	.6
Fall	56.0	102	4	8.97	2.10	10.54	.7
Year	54.2	109	−21	40.69	19.84	53.16	25.3

[1] This station was reported as Frederick prior to 1949.

[2] Average temperature based on an 86-year record, through 1955; highest and lowest temperatures based on a 60-year record, through 1952.

[3] Average precipitation based on an 86-year record, through 1955; wettest and driest years based on a 75-year record, in the period 1852–1955; snowfall based on a 61-year record, through 1952.

[4] Trace.

The average annual temperature is about 54° F. In an average year the temperature does not go above 95° in summer nor below 15° in winter, although extremes of 109° and −21° have been recorded. Winters are usually open and fairly mild, but they have frequent short, very cold periods. Some snow falls, but it does not usually last long. Winter crops receive little protection from a snow blanket in an average year. They are seldom damaged by cold, however, except on wet soils.

The summers are fairly short and temperatures are usually moderate. Maximum temperatures above 90° may occur for several days at a time. During such periods, the humidity is usually high in late afternoon and in evenings. The average annual relative humidity at 1:30 p.m. is only about 58 percent.

The average frost-free period at Frederick is 180 days. The average date of the last spring frost is April 19. and the average date of the first autumn

frost is October 16. Frosts have been recorded at Frederick as late as May 16 and as early as September 23. On the mountains, the average frost-free period is longer than in the valley. The earliest autumn frost recorded at Blue Ridge Summit was on October 7, and the latest spring frost recorded was on May 12. The reason for the longer growing season at the higher elevations is that cold air drains away from the sloping mountain areas and collects in the valleys. Because of the better air drainage, most of the commercial orchards of the county are located on mountain slopes and foot slopes. The normal grazing period in all parts of the county extends from about April 15 to about November 15.

The average annual precipitation is about 41 inches, and it is fairly well distributed through the year. Extended droughts are not common. Some short droughts damage corn, hay, or pasture on the shallower shaly and channery soils.

Wet periods cause more crop damage than droughts, especially on soils of the Readington, Croton, and Glenville series. Wetness of these soils delays seeding and germination in the spring and interferes with the small-grain harvest in the summer.

Most rains in winter, spring, and fall are slow and steady. The heavier showers that occur late in spring or while the snow is thawing increase the danger of flooding of bottom lands. Most creek bottoms are flooded at least once during the spring, and less frequently during the summer. After the principal flood danger is past, well-drained soils on the bottom lands are suitable for most crops. The somewhat poorly drained and poorly drained bottom-land soils remain wet too much of the time for any crops except pasture.

Vegetation

The natural vegetation of Frederick County is hardwood forest, which at one time covered the entire county. This forest is dominated by oaks, chiefly species of white and red oaks. Chestnut trees formerly made up about half of the stand in the mountains, but they have been killed out by chestnut blight. The only softwoods are scattered small areas of pines, mostly white pine and scrub Virginia pine, and a few hemlocks in the mountains.

The forests of the county now contain 76 species of hardwood trees and only 6 species of softwood trees. Of the hardwoods, 5 species are not native to the county but have been introduced (*5*). There are no savannas, prairies, or swamps in the county.

More detailed information about the forests is given in the section, Forests of the County.

Industries

Frederick is primarily an agricultural county, and a large proportion of its industry is in support of agriculture. Processing and sale of crops, dairy products, meat, and wood products are leading industries. The next most extensive industry is manufacture of clothing, leather goods, and shoes. Machinery and electronics firms are important also. Other industries, such as beverages, brushes, printing, perfume manufacture, optical goods, and others, are represented. The limestone quarries at Le Gore, Frederick, and Lime Kiln cover more than 120 acres. Many sandpits are located near Buckeystown.

Transportation and Marketing

Frederick County has about 91 miles of Federal highways. United States Highway No. 15 crosses the center of the county from south to north, from the Potomac River at Point of Rocks through the city of Frederick to the Pennsylvania State line, en route to Gettysburg, Pa.

United States Highway No. 40, known as the National Pike, traverses the county from east to west, from the direction of Baltimore through the city of Frederick west toward Hagerstown.

United States Highway No. 240 is the main route from the city of Frederick to Washington, D. C. United States Highway No. 340 extends from the city of Frederick southwestward toward Harpers Ferry, W. Va.

Parts of these highways are of throughway construction—four lanes with a dividing strip in the center. It is planned that all of the Federal highways eventually will be throughways.

There are 209 miles of State highways, which cover most parts of the county, and 1,000 miles of county roads. The greater part of the State and county roads are paved, and most of the remainder have hard gravel surfaces and are well maintained. Very few of the public roads of the county are not all-weather roads. Generally, these roads are closed only when covered by ice, deep snow, or snowdrifts. Except during extremes of weather, nearly all farms of the county have fairly easy access to markets and to the county seat.

Most communities on the main highways have regular bus service. Many trucking lines use the highways of the county. Most of the agricultural products of this area go to market by truck.

Four railroad lines serve Frederick County. A branch line of the Pennsylvania Railroad provides freight service only from York, Pa., to the city of Frederick. The main line of the Baltimore and Ohio Railroad runs along the northern bank of the Potomac River. It provides all types of rail service. Freight service only is provided by another line of the Baltimore and Ohio that runs across the southern part of the county from Mount Airy to Point of Rocks and has a branch that runs from Frederick Junction northward to the city of Frederick. There are large freight yards of the Baltimore and Ohio at Brunswick. The Potomac Edison Railroad carries freight between Frederick and Thurmont. The Western Maryland Railroad, carrying freight and passengers, crosses the northern part of the county from the direction of Baltimore, through Rocky Ridge and Thurmont, and out the northwestern corner of the county.

The Chesapeake and Ohio Canal passes through the southern edge of the county, along the north bank of the Potomac River. Regular service on this canal has

been discontinued, and it is now chiefly of historical interest.

The city of Frederick has a municipal airport, but no commercial service. The airport is used mostly by the Department of Defense in connection with the operation of Fort Detrick.

The county seat, Frederick, is the center of marketing, business, and industry in the county. The two chief markets for the agricultural products of Frederick County are Baltimore, Md., and Washington, D. C. Each of these cities is about 50 miles from the town of Frederick, and connected by excellent highways. Some dairy products go to Philadelphia, Pa., which is 141 miles from Frederick, by way of Baltimore. Considerable numbers of livestock and some other products are marketed in Lancaster, Pa., which is 87 miles from Frederick by highway.

Farm, Home, and Community Improvements

Frederick County has nine high schools. Middletown, Thurmont, Brunswick, and Walkersville, all in dominantly agricultural areas, each has a public high school. Emmitsburg has a public high school and a Catholic high school. The city of Frederick has two public high schools and a Catholic high school.

Junior high schools are located in Frederick and Libertytown. Many elementary schools are distributed in all parts of the county.

The city of Frederick has a junior college. Hood College, a private school for women, is also located in Frederick. St. Josephs College, a Catholic school for women, is at Emmitsburg, and Mount St. Marys College, a Catholic school for men, is near Emmitsburg. The Maryland State School for the Deaf is located in Frederick.

The county contains many churches of nearly all faiths, but the greater number of them are Lutheran.

A large proportion of the farm homes in this county have labor-saving facilities (*2*). Of the farm homes reported in the 1954 census, 97 percent had electricity and 79 percent had piped running water. Telephones were in 69 percent of the homes, and television sets in 68 percent. Home freezers were on 63 percent of the farms in 1954. In the same year, 3,750 automobiles were owned by the operators of 2,524 farms.

Agriculture

Agriculture is the leading occupation of Frederick County. Of the 424,960 acres of land in Frederick County, 328,692 acres is in farms. There are 2,792 farms in the county. About 66 percent are commercial farms, 11 percent are part-time farms, and 23 percent are residential farms only.

The average farm in Frederick County is a family farm, and most of the work is done by family members. Most of the hired labor is on the larger dairy farms of the Frederick Valley.

Farms of the County

Nearly half of the farms in Frederick County are dairy farms, and the next most important type of farm specializes in other livestock and poultry. The farms of the county were classified as follows in 1954:

	Number
Dairy farms	1,262
Poultry farms	105
Livestock farms other than dairy and poultry	180
General farms:	
Primarily crop farms	31
Primarily livestock farms	30
Crop-and-livestock farms	95
Field-crop farms:	
Cash-grain farms	60
Other field-crop farms	20
Vegetable farms	16
Fruit-and-nut farms	35
Miscellaneous and unclassified farms	965

The average farm in this county is about 118 acres in area. In the 1954 census the following sizes of farms were reported, and they covered the following acreage:

	Number	*Acreage*
Less than 10 acres	384	1,655
10 to 29 acres	339	6,065
30 to 49 acres	202	7,806
50 to 69 acres	190	11,175
70 to 99 acres	241	20,419
100 to 139 acres	451	52,983
140 to 179 acres	365	57,182
180 to 219 acres	255	50,449
220 to 259 acres	133	31,577
260 to 499 acres	200	66,677
500 to 999 acres	28	17,906
More than 1,000 acres	4	4,798

Of the 328,692 acres of land in farms of the county, 193,081 acres were classified as cropland. Of this, 157,153 acres were planted to crops in 1954, but only 155,928 acres were harvested. The other 1,225 acres planted were not harvested or pastured. Cropland used for pasture amounted to 30,771 acres, and 5,157 acres were left idle.

Pasture on cleared land other than cropland covered 72,814 acres; but 114,942 acres were used for pasture, if pastured cropland and pastured woodland are included.

Of the 49,159 acres of woodland on farms, 11,357 acres were pastured and 37,802 acres were not pastured. The remaining 13,638 acres of land on farms were used for roads, buildings, and other purposes.

In 1954, a total of 1,944 Frederick County farms, or 70 percent, were operated by their owners. Another 234 farms, or 8 percent, were operated by part owners. There were 586 farms, or 21 percent, operated by tenants, and only 28 farms, or 1 percent, operated by managers. Of the farms operated by tenants, 357 were operated by cash tenants, 109 by share tenants, 40 by share-and-cash tenants, 16 by croppers, and 64 by other or unspecified tenants.

In 1954, 1,292 farms, or 46 percent of the Frederick County farms were operated with tractors only, and no horses or mules. Both tractors and horses or mules were used in the operation of 617 of the farms, or 22 percent. There were 75 farms that had no tractor but used 2 or more horses or mules, and 120 farms

that used only 1 horse or mule for power. The 695 farms that used neither tractor nor workstock were probably the smallest farms.

The farms of Frederick County are well mechanized in comparison with those of other counties of the State. In 1954, 2,084 farms, or 74 percent, reported a total of 3,652 tractors. Only 56 of these were crawler tractors, and 641 were garden tractors; the remainder were wheel tractors. Trucks were reported on 1,534 farms, or 55 percent; and 90 percent reported automobiles. Numbers of farms reporting other major pieces of farm equipment were: Milking machines, 1,142; electric pig brooders, 55; power feed grinders, 577; grain combines, 362; corn pickers, 267; pick-up hay balers, 662; and field forage harvesters, 206. Artificial ponds, reservoirs, and earth tanks were reported on 512 farms.

Crops

Corn occupies the largest acreage of any crop in the county except hay. Wheat is nearly as extensive in acreage. Oats and barley are important grains, and some rye is grown. Soybeans are also an important crop.

Vegetables are a very important crop in this county, and sweet corn is the most extensively grown. Peas and tomatoes are important. A considerable acreage is used for orchards and vineyards.

The average pasture in the county consists of Kentucky bluegrass, usually mixed with various clovers. Many hay crops are grazed near the end of the rotations in which they are grown.

A list of the chief crops grown in the county and the number of acres used for each during 1954 follows:

	Acres
Corn:	
Harvested for grain	23,580
Cut for silage	13,116
Hogged, grazed, or cut for fodder	556
Grain threshed or combined:	
Wheat	22,950
Oats	9,429
Barley	7,910
Rye	1,194
Other grain	32
Soybeans:	
Harvested for beans	129
Cut for hay	1,062
Grazed or cut for silage	565
Plowed under for green manure	6
Hay:	
Alfalfa and alfalfa mixtures	15,840
Clover, timothy, and mixtures	41,063
Lespedeza	780
Small grains cut for hay	2,090
Other hay	6,513
Grass silage	3,966
Red clover seed harvested	665
Other field-crop seed harvested	55
Tobacco harvested	24
Irish potatoes harvested	[1]310
Miscellaneous field crops	146
Vegetables:	
Sweet corn	3,293
Snap beans	581
Green peas	404
Tomatoes	106
Cantaloups and muskmelons	6
Vegetables:	
Green lima beans	5
Cabbage	2
Other vegetables	5
Strawberries	15
Other berries	38

[1]Does not include acreage for farms with less than 20 bushels harvested.

There were 1,336 acres of orchards and vineyards reported in the 1954 census. The numbers of trees and vines of bearing age are listed below. These figures do not include data for farms with less than 20 trees or grapevines.

	Number
Crop:	
Apple trees	23,038
Peach trees	21,224
Pear trees	592
Cherry trees	3,346
Plum and prune trees	676
Grapevines	752

Livestock

Raising of cattle, especially dairy stock, is the chief agricultural enterprise of this county. Frederick County leads the State in numbers of cattle on farms and in numbers sold, as well as in dairy products marketed. The agricultural census taken in the last 3 months of 1954 listed 78,014 cattle and calves on the farms of the county. Of these, 44,287 were milk cows, and 23,798 were heifers and heifer calves. During the previous year, 38,661 cattle and calves had been sold alive.

There were 1,815 horses and mules on the farms at the time of the census, and 134 had been sold alive in 1954. Numbers of hogs and pigs totalled 17,112, but 12,357 had been sold during the previous year. Of the 2,197 sheep and lambs on farms during the census, 1,650 were ewes, 391 were lambs, and 156 were rams and wethers. Farmers had sold 1,391 sheep and lambs during 1954.

Chickens over 4 months old numbered 234,418 when the census was taken. During the year before, 296,488 chickens and 1,200,232 dozen eggs had been sold from the county farms. In 1954, 32,068 turkeys and 8,793 ducks were raised.

Glossary

Aggregate, soil.—A single mass or cluster consisting of many primary soil particles held together in a form such as a prism, crumb, or granule.

Alluvial soil.—Soil formed from alluvium and showing little or no modification of the original materials by soil-forming processes.

Alluvium.—Material, such as gravel, sand, silt, or clay, deposited by a stream of water.

Base saturation.—The relative degree to which a soil has absorbed metallic cations (calcium, potassium, magnesium, etc.). The proportion of the cation-exchange capacity that is saturated with metallic cations (*9*).

Bedrock.—The solid rock that underlies the soils and other unconsolidated material or that is exposed at the surface.

Breccia.—A rock composed of angular fragments of one kind of rock set in a matrix or cement of another kind of rock. For example, in breccia in Frederick County, angular

fragments of limestone are set in a matrix of red Triassic shale.

Calcareous.—Containing calcium carbonate, or lime.

Calciferous schist.—Schist that contains free calcium carbonate.

California Bearing Ratio, or CBR.—The ratio of the capacity of a soil to support weight to that of a standard crushed limestone from California. Thus, a soil with a CBR of 7 would support 7 percent of the load that could be supported by the crushed limestone per unit area and with the same degree of distortion.

Channery.—Containing thin, flat fragments of sandstone, limestone, or schist up to 6 inches along the longer axis.

Chert.—A flintlike rock, generally an impurity in limestone or other sedimentary rock.

Claypan.—A compact horizon or layer rich in clay and separated more or less abruptly from the overlying horizon.

Clayskin.—A thin layer of clay coating the outside surface of a soil aggregate.

Cobbly.—Containing rounded or partly rounded fragments of rock 3 to 10 inches in diameter.

Colluvium.—Material that has been moved downhill by gravity, soil creep, frost action, or local erosion. It accumulates on lower slopes and at the foot of slopes.

Conglomerate.—Rock composed of gravel and rounded stones cemented together by hardened clay, lime, iron oxide, or silica.

Consistence.—The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are as follows:

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under moderate pressure between thumb and forefinger, and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure, but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material.

Hard.—When dry, moderately resistant to pressure; can barely be broken between thumb and forefinger.

Cemented.—Hard and brittle; little affected by moistening.

Cover crops.—Close-growing crops, grown primarily to improve the soil and protect it between periods of regular crop production; or crops grown between trees in orchards.

Diabase.—A basic igneous rock, composed essentially of plagioclase feldspar and augite with small quantities of magnetite and apatite.

Dike.—Igneous rock that was forced into a vertical crack or fissure while molten, then hardened in that shape.

Drainage, soil.—The relative rapidity and extent of removal of water from on and within the soil, under natural conditions. Terms commonly used to describe drainage are as follows:

Very poorly drained.—Water is removed so slowly that the soil remains wet most of the time, and water ponds on the surface frequently.

Poorly drained.—Water is removed so slowly that the soil is wet for a large part of the time.

Somewhat poorly drained.—Water is removed from the soil slowly enough to keep it wet for significant periods but not all of the time.

Moderately well drained.—Water is removed from the soil somewhat slowly, so that the profile is wet for a small but significant part of the time.

Well drained.—Water is removed from the soil readily but not rapidly.

Somewhat excessively drained.—Water is removed from the soil rapidly.

Excessively drained.—Water is removed from the soil very rapidly.

Erodible.—Susceptible to erosion; easily lost through the action of water or wind.

Erosion.—The wearing away of the surface of the soil by running water, wind, or other geological agencies. **Sheet erosion** is the removal of soil from the surface of an area without developing definite channels. **Rill erosion** is the removal of soil by development of small channels for water. **Gully erosion** is the removal of soil by development of large channels for water. The soils have been mapped by degrees of erosion, which mean in general terms:

Moderately eroded.—The loss of soil has been significant but not yet serious.

Severely eroded.—The soil losses have been serious and generally have resulted in a sharp decline in productivity.

Very severely eroded.—Soil losses have been so serious that they have entirely changed the suitability of the soil for crops and destroyed its general productivity.

Flaggy.—Containing thin fragments of rock measuring 6 to 15 inches along the longer axis.

Flood plain.—A nearly level area, subject to overflow, that occurs along a stream.

Fragipan.—A very compact horizon, rich in silt but relatively low in clay, that generally interferes with the penetration of roots and water.

Gneiss.—A crystalline rock in which the component minerals are arranged in parallel bands or layers. This rock tends to cleave into slabs.

Gravelly.—Containing rounded or angular, but generally not flat, fragments of rock up to 3 inches in diameter.

Greenstone.—A local name for metabasalt.

Horizon, soil.—A layer of soil, approximately parallel to the soil surface, with distinct characteristics produced by soil-forming processes. Horizons are identified by letters of the alphabet.

A horizon.—The horizon at the surface. It contains organic matter, or it has been leached of soluble minerals and clay, or it shows the effects of both. The major A horizon may be subdivided into A_1, the part that is darkest in color because it contains organic matter, and A_2, the part that is the most leached and light-colored layer in the profile. Where the upper layers of the soil are thoroughly mixed by cultivation, this plow layer is called the A_p horizon.

B horizon.—The horizon in which clay, minerals, or other material has accumulated, or which has developed a characteristic blocky or prismatic structure, or which shows the characteristics of both processes. It may be subdivided into B_1, B_2, or B_3 horizons. The B_2 horizon may be subdivided further by adding a number to the symbol such as B_{21}, B_{22}, or B_{23}. Other subscripts may be added to the horizon symbol, such as $_{ca}$ to indicate accumulations of concretions, $_m$ to indicate a massive horizon or fragipan, $_t$ to indicate an unusual accumulation of clay, or $_g$ to indicate gleying.

C horizon.—The unconsolidated material immediately under the true soil. It is presumed to be similar in chemical, physical, and mineral composition to the material from which at least part of the overlying solum has developed.

D horizon.—The stratum beneath the parent material. If it consists of solid rock like that from which the parent material has developed, it is designated as D_r. If it is not like the parent material of the soil, it called a D_u horizon.

Gleyed horizon.—A strongly mottled or gray horizon that occurs in wet soils. It is designated by the letters BG, CG, or merely by G. A horizon only slightly gleyed may have the subscript $_g$ added to the symbol.

Igneous rock.—A rock produced through the cooling of melted minerals.

Leached layer.—A layer in which the soluble constituents have been dissolved and washed away by percolating water.

Limestone.—A rock made up principally of calcium carbonate or magnesium carbonate. Some limestone is fairly pure; other limestone contains various kinds and amounts of impurities.

Liquid limit.—The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for carrying loads.

Mapping unit.—A soil, land type, or combination of soils that is given a separate name and symbol in the mapping. A mapping unit, as outlined on the soil map, may include up to 15 percent of soils or land types that do not fit the general description of the mapping unit.

Marble.—Limestone that has been changed by heat and pressure until it is definitely crystalline in form.

Maximum dry density.—The greatest amount of soil that can be compacted into a unit of volume. It is expressed in pounds of dry soil per cubic foot.

Mechanical analysis.—The determination of the percentage of soil particles of various sizes, such as gravel, sand, silt, and clay.

Metabasalt.—Basalt that has been changed by heat and pressure to a form of schist; locally called greenstone.

Metamorphic rock.—A rock that has been considerably altered by the combined action of pressure, heat, and water. Generally the resulting rock is more compact and more highly crystalline than the original. Gneiss, schist, and marble are common examples.

Mica-schist.—A schist that contains a large proportion of mica, generally in very fine flakes.

Micaceous.—Containing mica.

Mottling, soil.—Contrasting color patches that vary in number and size. Descriptive terms are as follows: Contrast—**faint, distinct,** and **prominent;** abundance—**few, common,** and **many;** and size—**fine, medium,** and **coarse.** The size measurements are the following: **Fine,** less than 5 millimeters; **medium,** ranging from 5 to 15 millimeters; and **coarse,** more than 15 millimeters in diameter along the greatest dimension.

Optimum moisture.—The moisture content at which maximum dry density of a soil can be obtained by compaction.

Parent material.—The disintegrated rock material or mixture of materials that, through the soil-forming processes, is developed into a soil.

Percent slope.—The gradient of any particular slope, expressed as the difference in elevation in feet between two points 100 feet apart horizontally.

Permeability.—That quality of the soil that enables it to transmit water or air. Terms used to describe permeability are: **Very slow, slow, moderately slow, moderate, moderately rapid, rapid,** and **very rapid.** Relative permeability is given for each horizon of each soil series in table 7, and rates of flow of water through a saturated soil are given in a footnote of that table.

Phyllite.—A micaceous schist, intermediate between mica-schist and slate.

Physiographic province.—One of the major geographic divisions of the continent.

Plastic limit.—The moisture content at which a soil changes from a semisolid to a plastic state.

Plasticity index.—The numerical difference between the liquid limit and the plastic limit; the range in moisture content through which the soil remains plastic.

Porcelanite.—Shale that has been so altered by heat and pressure that it is hard, somewhat crystalline, and porcelainlike in appearance.

Profile.—A vertical section of the soil through all its horizons and extending into the parent material.

Quartz.—A rock made up chiefly or entirely of silicon dioxide.

Quartzite.—Quartz or sandstone that has been altered by heat and pressure until it is compact, fused, and crystalline.

Quartzose schist.—Schist that contains a large proportion of fine quartzite.

Reaction, soil.—The degree of acidity or alkalinity of the soil, expressed in pH values or in classes. These classes are defined in a footnote to table 7.

Residuum.—Material that has been weathered from the underlying rock but has not been moved from its place of origin. A soil developed in residuum is a residual soil.

Rocky.—Having fixed outcrops of bedrock, as distinguished from loose stones.

Runoff.—Water that flows away over the surface of the soil without sinking in.

Sandstone.—A rock consisting chiefly of grains of sand cemented together.

Schist.—A rock that has a parallel or foliated structure secondarily developed in it by shearing, a process generally accompanied by more or less recrystallization of the constituent minerals in layers parallel to the cleavage; splits or cleaves readily.

Sedimentary rock.—A rock formed from an accumulation of sediment in water. The principal groups of sedimentary rocks are (1) conglomerates (from gravels), (2) sandstone (from sands), (3) shales (from clays), and (4) limestones (from calcium carbonate deposits).

Sericite.—A mica mineral.

Sericitic schist.—Schist that contains a large amount of sericite.

Series, soil.—A group of soils that have horizons similar, except for the texture of the surface soil, as to differentiating characteristics and arrangement in the soil profile, and developed from a particular kind of parent material.

Shale.—A sedimentary rock formed by hardening of clay deposits into rock.

Shaly.—Containing flat fragments of shale less than 6 inches along the longer axis.

Slate.—A dense, fine-grained rock produced by the alteration of clay or shale by heat and pressure; has a characteristic cleavage. Porcelanite is a kind of slate.

Slaty.—Containing fragments of slate less than 6 inches along the longer axis.

Solum.—The upper part of the soil profile, above the parent material; the part of the profile that has been noticeably affected by the soil-forming processes. The solum of mature soils consists of the A and B horizons.

Stony.—Containing rounded rock fragments larger than 10 inches in diameter or flat rock fragments more than 15 inches along the longer axis.

Stripcropping.—Growing alternate strips of close-growing crops and clean-tilled crops or fallow on the contour or parallel to terraces.

Structure, soil.—The arrangement of the primary soil particles into lumps, granules, or other aggregates. Structure is described by grade—**weak, moderate,** or **strong,** that is, the distinctness and durability of the aggregates; by the size of the aggregates—**very fine, fine, medium, coarse,** or **very coarse;** and by their shape—**platy, prismatic, columnar, blocky, granular,** or **crumb.** A soil is described as structureless if there are no observable aggregates. Structureless soils may be massive (coherent) or single grain (noncoherent).

- **Blocky, angular.**—Aggregates are shaped like blocks; they may have flat or rounded surfaces that join at sharp angles.
- **Blocky, subangular.**—Aggregates have some rounded and some flat surfaces; upper sides are rounded.
- **Columnar.**—Aggregates are prismatic and are rounded at the top.
- **Crumb.**—Aggregates are generally soft, small, porous, and irregular, but tend toward a spherical shape.
- **Granular.**—Aggregates are roughly spherical, firm, and small. They may be either hard or soft but are generally more firm and less porous than crumb and without the distinct faces of blocky structure.
- **Platy.**—Aggregates are flaky or platelike.
- **Prismatic.**—Aggregates have flat vertical surfaces, and their height is greater than their width.

Subgrade modulus.—The resistance of the soil to displacement under load, expressed in pounds per square inch of area, per inch of deformation. Thus, if a load of 1,000 pounds on 100 square inches of surface penetrates 1 inch, the modulus is 10.

Subsoil.—The soil layers below the plow layer; the B horizon.

Substratum.—The soil material below the surface soil and the subsoil; the C or D horizon.

Talcose schist.—Schist that contains a large proportion of talc or other mineral that resembles talc in physical properties.

Terrace soil.—A soil developed on old to very old deposits of alluvium, commonly on benchlike terraces now well above present flood plains of streams.

Texture, soil.—The relative amounts of particles of different size classes, called sand, silt, and clay, determine texture. The common soil textures in Frederick County are sandy loam, fine sandy loam, loam, silt loam, silty clay loam, clay loam, and clay. Each of these texture names covers a given range in content of sand, silt, and clay.

- **Sand.**—Small rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter.
- **Silt.**—Small mineral soil grains ranging from 0.05 millimeter to 0.002 millimeter in diameter.
- **Clay.**—Small mineral soil grains, less than 0.002 millimeter in diameter.

Topsoil.—Presumably fertile soil material, usually rich in organic matter and suitable as a surfacing for roadbanks, lawns, and gardens.

Triassic rocks.—Rocks that were formed during the Triassic geologic period. In Frederick County they consist of dark-red shale and sandstone.

Upland soil.—In this county, used to mean a residual soil, in contrast to an alluvial soil, a colluvial soil, or a terrace soil. It does not refer specifically to elevation, since colluvial or alluvial soils may be higher up in mountains than some of the upland soils.

Water-holding capacity.—The ability of a soil to hold water that will not drain away but can be taken up by plant roots.

Water table.—The upper surface of the ground water.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1955. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 7, 2 vols., 257 and 514 pp., illus.

(2) HAMILTON, A. B.
1956. COMPARATIVE CENSUS OF MARYLAND AGRICULTURE BY COUNTIES. Univ. of Md. Extension Service, Misc. Ext. Pub. No. 32f., 52 pp.

(3) HOCKENSMITH, R. D., AND STEELE, J. G.
1949. RECENT TRENDS IN THE USE OF THE LAND-CAPABILITY CLASSIFICATION. Proc. Soil Sci. Soc. Amer., vol. 14. 383-388, illus.

(4) LATIMER, W. J., AVON BURKE, R. T., AND BRUCE, O. C.
1922. SOIL SURVEY OF FREDERICK COUNTY, MARYLAND. U. S. Dept. Agr. Bur. of Soils, Md. Geol. Sur., and Md. Agr. Expt. Sta. *In* Field Operations of the Bureau of Soils, 1919. pp. 641-722, map.

(5) MARYLAND BOARD OF NATURAL RESOURCES, DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES.
1946. THE PHYSICAL FEATURES OF CARROLL COUNTY AND FREDERICK COUNTY. 312 pp., illus. Baltimore.

(6) PORTLAND CEMENT ASSOCIATION.
1956. PCA SOIL PRIMER. 86 pp., illus. Chicago.

(7) THORP, JAMES, AND SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: order, suborder, and great soil groups. Soil Sci. 67(2); 117-126.

(8) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U. S. Dept. Agr. Handbook No. 18, 503 pp., illus.

(9) _____
1957. SOIL. U. S. Dept. Agr. Yearbook, 784 pp., illus.

(10) WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS.
1953. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. 3-357, 2 vols. and appendix. 48 pp. and charts.

GUIDE TO MAPPING UNITS AND CAPABILITY UNITS

[See table 2, p. 31, for estimated productivity ratings of each soil, and table 3, p. 48 for approximate acreage and proportionate extent of the soils. See table 9, p. 114, for information on engineering properties of the soils]

Map symbol	Mapping unit	Page	Capability unit	Page
Aa	Alluvial land	51	Vw-1	26
AbA	Athol gravelly loam, 0 to 3 percent slopes	52	I-1	13
AbB2	Athol gravelly loam, 3 to 8 percent slopes, moderately eroded	52	IIe-1	14
AbC2	Athol gravelly loam, 8 to 15 percent slopes, moderately eroded	52	IIIe-1	19
AbD2	Athol gravelly loam, 15 to 25 percent slopes, moderately eroded	52	IVe-1	24
AcB2	Athol rocky loam, 0 to 15 percent slopes, moderately eroded	52	VIs-1	28
AdA	Augusta gravelly loam, 0 to 3 percent slopes	53	IIw-1	18
AdB2	Augusta gravelly loam, 3 to 15 percent slopes, moderately eroded	53	IIIe-13	21
AeB	Augusta silt loam, 0 to 8 percent slopes	53	IIw-1	18
AgB	Augusta very stony loam, 0 to 8 percent slopes	53	VIs-2	28
BaA	Bermudian fine sandy loam, 0 to 3 percent slopes	53	I-6	14
BbA	Bermudian silt loam, 0 to 3 percent slopes	53	I-6	14
BcA	Birdsboro silt loam, 0 to 3 percent slopes	54	I-4	13
BcB2	Birdsboro silt loam, 3 to 8 percent slopes, moderately eroded	54	IIe-4	15
BdB	Bowmansville silt loam, 0 to 8 percent slopes	54	VIw-1	28
BeB	Braddock cobbly loam, 3 to 8 percent slopes	55	IIe-4	15
BgB2	Braddock gravelly loam, 3 to 8 percent slopes, moderately eroded	55	IIe-4	15
BhC2	Braddock gravelly and cobbly loams, 8 to 15 percent slopes, moderately eroded	55	IIIe-4	19
BkB	Braddock very stony loam, 3 to 15 percent slopes	55	VIs-2	28
BmD2	Braddock soils, 15 to 25 percent slopes, moderately eroded	55	VIIs-3	30
BnB2	Brandywine gravelly loam, 0 to 15 percent slopes, moderately eroded	55	IIIe-40	23
BnD2	Brandywine gravelly loam, 15 to 25 percent slopes, moderately eroded	55	IVe-10	25
BnE3	Brandywine gravelly loam, 15 to 55 percent slopes, severely eroded	55	VIIe-3	29
BoA	Bucks silt loam, 0 to 3 percent slopes	56	I-4	13
BoB2	Bucks silt loam, 3 to 8 percent slopes, moderately eroded	56	IIe-4	15
CaB2	Captina silt loam, 0 to 8 percent slopes, moderately eroded	56	IIe-14	17
CbB2	Cardiff channery loam, 0 to 8 percent slopes, moderately eroded	57	IIe-10	16
CbC2	Cardiff channery loam, 8 to 15 percent slopes, moderately eroded	57	IIIe-10	20
CbC3	Cardiff channery loam, 8 to 15 percent slopes, severely eroded	57	IVe-10	25
CbD2	Cardiff channery loam, 15 to 25 percent slopes, moderately eroded	57	IVe-10	25
CbD3	Cardiff channery loam, 15 to 25 percent slopes, severely eroded	57	VIe-3	27
CbE2	Cardiff channery loam, 25 to 45 percent slopes, moderately eroded	57	VIe-3	27
CbE4	Cardiff channery loam, 15 to 55 percent slopes, very severely eroded	57	VIIe-3	29
CbF2	Cardiff channery loam, 45 to 55 percent slopes, moderately eroded	57	VIIe-3	29
CcB2	Catoctin channery silt loam, 0 to 10 percent slopes, moderately eroded	57	IIe-10	16
CcC2	Catoctin channery silt loam, 10 to 20 percent slopes, moderately eroded	58	IIIe-10	20
CcC3	Catoctin channery silt loam, 10 to 20 percent slopes, severely eroded	58	IVe-10	25
CcD2	Catoctin channery silt loam, 20 to 35 percent slopes, moderately eroded	58	VIe-3	27
CcD3	Catoctin channery silt loam, 20 to 35 percent slopes, severely eroded	58	VIe-3	27
CcE4	Catoctin channery silt loam, 20 to 55 percent slopes, very severely eroded	58	VIIe-3	29
CcF2	Catoctin channery silt loam, 35 to 55 percent slopes, moderately eroded	58	VIe-3	27
CdA	Chalfont silt loam, 0 to 3 percent slopes	58	IIIw-11	24
CdB	Chalfont silt loam, 3 to 15 percent slopes	58	IIIe-13	21
CeB2	Chandler and Talladega channery loams, 0 to 10 percent slopes, moderately eroded	59	IIe-25	18
CeC2	Chandler and Talladega channery loams, 10 to 20 percent slopes, moderately eroded	59	IIIe-25	22
CeD2	Chandler and Talladega channery loams, 20 to 35 percent slopes, moderately eroded	59	VIe-3	27
CeD3	Chandler and Talladega channery loams, 20 to 35 percent slopes, severely eroded	59	VIe-3	27
CeE2	Chandler and Talladega channery loams, 35 to 45 percent slopes, moderately eroded	59	VIIe-3	29
CgB2	Chandler and Talladega silt loams, 0 to 10 percent slopes, moderately eroded	59	IIe-25	18
CgC2	Chandler and Talladega silt loams, 10 to 20 percent slopes, moderately eroded	59	IIIe-25	22
CgD2	Chandler and Talladega silt loams, 20 to 35 percent slopes, moderately eroded	59	VIe-3	27
CgD3	Chandler and Talladega silt loams, 20 to 35 percent slopes, severely eroded	59	VIe-3	27
ChC2	Chandler and Talladega very stony loams, 0 to 20 percent slopes, moderately eroded	59	VIs-2	28
ChD2	Chandler and Talladega very stony loams, 20 to 45 percent slopes, moderately eroded	59	VIIs-3	30
CkA2	Chester loam, 0 to 3 percent slopes, moderately eroded	60	I-4	13
CkB2	Chester loam, 3 to 8 percent slopes, moderately eroded	60	IIe-4	15
CkC2	Chester loam, 8 to 15 percent slopes, moderately eroded	60	IIIe-4	19
CmA	Chewacla silt loam, 0 to 3 percent slopes	60	Vw-1	26
CnB	Clymer very stony loam, 0 to 20 percent slopes	61	VIs-2	28
CoA	Colbert silt loam, deep variant, 0 to 3 percent slopes	61	IIw-2	19
CpB2	Conestoga silt loam, 0 to 8 percent slopes, moderately eroded	62	IIe-24	17
CpC2	Conestoga silt loam, 8 to 15 percent slopes, moderately eroded	62	IIIe-24	22
CpD2	Conestoga silt loam, 15 to 25 percent slopes, moderately eroded	62	IVe-1	24
CrA	Congaree silt loam, 0 to 3 percent slopes	63	I-6	14
CsA	Congaree silt loam, local alluvium, 0 to 3 percent slopes	63	I-4	13
CsB	Congaree silt loam, local alluvium, 3 to 8 percent slopes	63	IIe-4	15

GUIDE TO MAPPING UNITS AND CAPABILITY UNITS—Continued

Map symbol	Mapping unit	Page	Capability unit	Page
CtB	Croton silt loam, overwashed, 0 to 8 percent slopes	63	Vw–2	26
DaB2	Dekalb loam, 0 to 10 percent slopes, moderately eroded	64	IIe–10	16
DaC2	Dekalb loam, 10 to 20 percent slopes, moderately eroded	64	IIIe–10	20
DbC	Dekalb very stony loam, 0 to 35 percent slopes	64	VIIs–2	29
DcA	Duffield silt loam, 0 to 3 percent slopes	64	I–1	13
DdA2	Duffield and Frankstown shaly silt loams, 0 to 3 percent slopes, moderately eroded	65	IIe–1	14
DdB2	Duffield and Frankstown shaly silt loams, 3 to 8 percent slopes, moderately eroded	65	IIe–1	14
DdC2	Duffield and Frankstown shaly silt loams, 8 to 15 percent slopes, moderately eroded	65	IIIe–1	19
DeA	Duffield and Frankstown silt loams, 0 to 3 percent slopes	64	IIe–1	14
DeB2	Duffield and Frankstown silt loams, 3 to 8 percent slopes, moderately eroded	64	IIe–1	14
DeC2	Duffield and Frankstown silt loams, 8 to 15 percent slopes, moderately eroded	64	IIIe–1	19
DeD2	Duffield and Frankstown silt loams, 15 to 25 percent slopes, moderately eroded	65	IVe–1	24
EaB2	Edgemont gravelly loam, 0 to 8 percent slopes, moderately eroded	65	IIe–25	18
EaC2	Edgemont gravelly loam, 8 to 15 percent slopes, moderately eroded	65	IIIe–25	22
EaD2	Edgemont gravelly loam, 15 to 25 percent slopes, moderately eroded	65	IVe–25	25
EaE	Edgemont gravelly loam, 25 to 45 percent slopes	65	VIe–3	27
EbC	Edgemont very stony loam, 0 to 20 percent slopes	65	VIs–2	28
EbE	Edgemont very stony loam, 20 to 60 percent slopes	65	VIIs–3	30
EcB2	Edgemont-Chandler channery loams, 0 to 10 percent slopes, moderately eroded	65	IIe–10	16
EcC2	Edgemont-Chandler channery loams, 10 to 20 percent slopes, moderately eroded	66	IIIe–10	20
EcC3	Edgemont-Chandler channery loams, 10 to 20 percent slopes, severely eroded	66	IVe–10	25
EcD2	Edgemont-Chandler channery loams, 20 to 35 percent slopes, moderately eroded	66	VIe–3	27
EcD3	Edgemont-Chandler channery loams, 20 to 35 percent slopes, severely eroded	66	VIe–3	27
EdC	Edgemont-Chandler very stony loams, 0 to 20 percent slopes	66	VIs–2	28
EdE	Edgemont-Chandler very stony loams, 20 to 60 percent slopes	66	VIIs–3	30
EeB2	Elioak gravelly loam, 3 to 8 percent slopes, moderately eroded	66	IIe–4	15
EeC2	Elioak gravelly loam, 8 to 15 percent slopes, moderately eroded	66	IIIe–4	19
EgA2	Elioak silt loam, 0 to 3 percent slopes, moderately eroded	66	I–4	13
EgB2	Elioak silt loam, 3 to 8 percent slopes, moderately eroded	66	IIe–4	15
EhB2	Elk gravelly loam, 3 to 8 percent slopes, moderately eroded	67	IIe–1	14
EkA	Elk loam, 0 to 3 percent slopes	67	I–1	13
EkB2	Elk loam, 3 to 8 percent slopes, moderately eroded	67	IIe–1	14
EkC2	Elk loam, 8 to 15 percent slopes, moderately eroded	67	IIIe–1	19
FaA	Fauquier gravelly loam, 0 to 3 percent slopes	68	I–4	13
FaB2	Fauquier gravelly loam, 3 to 10 percent slopes, moderately eroded	68	IIe–4	15
FaC2	Fauquier gravelly loam, 10 to 20 percent slopes, moderately eroded	68	IIIe–4	19
FaD2	Fauquier gravelly loam, 20 to 35 percent slopes, moderately eroded	68	VIe–2	27
FaE3	Fauquier gravelly loam, 20 to 45 percent slopes, severely eroded	68	VIe–3	27
FbA	Fauquier loam, 0 to 3 percent slopes	68	I–4	13
FbB2	Fauquier loam, 3 to 8 percent slopes, moderately eroded	68	IIe–4	15
FbC2	Fauquier loam, 8 to 15 percent slopes, moderately eroded	68	IIIe 4	19
FcC2	Fauquier loam, shallow, 8 to 15 percent slopes, moderately eroded	68	IVe–10	25
FcE2	Fauquier loam, shallow, 15 to 45 percent slopes, moderately eroded	68	VIIe–3	29
FdA	Fauquier silt loam, 0 to 3 percent slopes	68	I–4	13
FdB2	Fauquier silt loam, 0 to 10 percent slopes, moderately eroded	68	IIe–4	15
FdC2	Fauquier silt loam, 10 to 20 percent slopes, moderately eroded	68	IIIe–4	19
FdD2	Fauquier silt loam, 20 to 35 percent slopes, moderately eroded	68	VIe–2	27
FeC4	Fauquier silty clay loam, 10 to 20 percent slopes, very severely eroded	68	VIe–3	27
FeD3	Fauquier silty clay loam, 20 to 35 percent slopes, severely eroded	68	VIe–3	27
FeD4	Fauquier silty clay loam, 20 to 45 percent slopes, very severely eroded	68	VIIe 3	29
FgC2	Fauquier very stony loam, 0 to 20 percent slopes, moderately eroded	68	VIs–2	28
FgE2	Fauquier very stony loam, 20 to 50 percent slopes, moderately eroded	68	VIIs–3	30
GaB2	Glenelg gravelly loam, 0 to 8 percent slopes, moderately eroded	69	IIe–4	15
GaC2	Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded	69	IIIe–4	19
GaD2	Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded	69	IVe–25	25
GaD3	Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded	69	VIe 3	27
GaE4	Glenelg gravelly loam, 15 to 45 percent slopes, very severely eroded	69	VIIe–3	29
GbB2	Glenelg and Chester loams, 3 to 8 percent slopes, moderately eroded	69	IIe–4	15
GbC2	Glenelg and Chester loams, 8 to 15 percent slopes, moderately eroded	69	IIIe–4	19
GbD2	Glenelg and Chester loams, 15 to 25 percent slopes, moderately eroded	69	IVe–25	25
GcA2	Glenelg and Chester silt loams, 0 to 3 percent slopes, moderately eroded	69	I–4	13
GcB2	Glenelg and Chester silt loams, 3 to 8 percent slopes, moderately eroded	70	IIe–4	15
GcC2	Glenelg and Chester silt loams, 8 to 15 percent slopes, moderately eroded	70	IIIe–4	19
GcD2	Glenelg and Chester silt loams, 15 to 45 percent slopes, moderately eroded	70	IVe 3	24
GdB	Glenville silt loam, 0 to 8 percent slopes	70	IIw–1	18
GdB2	Glenville silt loam, 3 to 8 percent slopes, moderately eroded	70	IIIe–13	21
GeB	Glenville very stony silt loam, 0 to 8 percent slopes	70	VIs–2	28
GgA	Guthrie silt loam, 0 to 3 percent slopes	71	Vw–2	26
HaA	Hagerstown gravelly loam, 0 to 3 percent slopes	71	I–1	13
HaB2	Hagerstown gravelly loam, 3 to 8 percent slopes, moderately eroded	71	IIe–1	14
HaC2	Hagerstown gravelly loam, 8 to 15 percent slopes, moderately eroded	71	IIIe–1	19
HbA	Hagerstown loam, 0 to 3 percent slopes	72	I–1	13
HbB2	Hagerstown loam, 0 to 8 percent slopes, moderately eroded	72	IIe–1	14
HbC2	Hagerstown loam, 8 to 15 percent slopes, moderately eroded	72	IIIe–1	19

GUIDE TO MAPPING UNITS AND CAPABILITY UNITS—Continued

Map symbol	Mapping unit	Page	Capability unit	Page
HbD2	Hagerstown loam, 15 to 25 percent slopes, moderately eroded	72	IVe–1	24
HcC3	Hagerstown rocky clay, 8 to 15 percent slopes, severely eroded	72	VIs–1	28
HcD3	Hagerstown rocky clay, 15 to 25 percent slopes, severely eroded	72	VIIe–1	29
HdB2	Hagerstown rocky loam, 3 to 15 percent slopes, moderately eroded	72	VIs–1	28
HeA	Hagerstown silt loam, 0 to 3 percent slopes	72	I–1	13
HeB2	Hagerstown silt loam, 3 to 8 percent slopes, moderately eroded	72	IIe–1	14
HeC2	Hagerstown silt loam, 8 to 15 percent slopes, moderately eroded	72	IIIe–1	19
HgB2	Highfield channery loam, 0 to 10 percent slopes, moderately eroded	73	IIe–25	18
HgC2	Highfield channery loam, 10 to 20 percent slopes, moderately eroded	73	IIIe–25	22
HgD2	Highfield channery loam, 20 to 35 percent slopes, moderately eroded	73	VIe–3	27
HgD3	Highfield channery loam, 20 to 35 percent slopes, severely eroded	73	VIe–3	27
HgD4	Highfield channery loam, 20 to 35 percent slopes, very severely eroded	73	VIIe–3	29
HgE2	Highfield channery loam, 35 to 45 percent slopes, moderately and severely eroded	73	VIIe–3	29
HhB2	Highfield silt loam, 0 to 10 percent slopes, moderately eroded	73	IIe–25	18
HhC2	Highfield silt loam, 10 to 20 percent slopes, moderately eroded	73	IIIe–25	22
HhD3	Highfield silt loam, 20 to 35 percent slopes, severely eroded	73	VIe–3	27
HkC	Highfield very stony loam, 0 to 20 percent slopes	73	VIs–2	28
HkE	Highfield very stony loam, 20 to 45 percent slopes	73	VIIs–3	30
HmA	Huntington fine sandy loam, 0 to 3 percent slopes	74	I–6	14
HnA	Huntington silt loam, 0 to 3 percent slopes	74	I–6	14
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LaB	Lantz silt loam, 0 to 8 percent slopes	74	Vw–2	26
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LeB	Legore very stony clay loam, 0 to 15 percent slopes	75	VIs–2	28
LeE	Legore very stony clay loam, 15 to 50 percent slopes	75	VIIs–3	30
LgC2	Lehigh slaty loam, 3 to 15 percent slopes, moderately eroded	76	IIIe–13	21
LhC4	Lehigh slaty silty clay loam, 3 to 15 percent slopes, very severely eroded	76	VIIs–3	30
LkA	Lindside silt loam, 0 to 3 percent slopes	76	Vw–1	26
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MaC2	Manor channery and gravelly loams, 8 to 15 percent slopes, moderately eroded	78	IIIe–10	20
MaC3	Manor channery and gravelly loams, 8 to 15 percent slopes, severely eroded	78	IVe–10	25
MaD2	Manor channery and gravelly loams, 15 to 25 percent slopes, moderately eroded	78	IVe–10	25
MaD3	Manor channery and gravelly loams, 15 to 25 percent slopes, severely eroded	78	VIe–3	27
MaD4	Manor channery and gravelly loams, 15 to 25 percent slopes, very severely eroded	78	VIIe–3	29
MaE2	Manor channery and gravelly loams, 25 to 45 percent slopes, moderately eroded	78	VIe–3	27
MaE3	Manor channery and gravelly loams, 25 to 55 percent slopes, severely and very severely eroded	78	VIIe–3	29
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MdC2	Montalto silty clay loam, 8 to 15 percent slopes, moderately eroded	79	IIIe–4	19
MdD2	Montalto silty clay loam, 15 to 25 percent slopes, moderately eroded	79	IVe–3	24
MeB2	Montalto very stony clay loam, 0 to 15 percent slopes, moderately eroded	79	VIs–2	28
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MhA	Myersville and Fauquier gravelly loams, 0 to 3 percent slopes	80	I–4	13
MhB2	Myersville and Fauquier gravelly loams, 3 to 8 percent slopes, moderately eroded	80	IIe–4	15
MhC2	Myersville and Fauquier gravelly loams, 8 to 15 percent slopes, moderately eroded	80	IIIe–4	19
MkA	Myersville and Fauquier loams, 0 to 3 percent slopes	80	I–4	13
MkB2	Myersville and Fauquier loams, 3 to 8 percent slopes, moderately eroded	80	IIe–4	15
MkC2	Myersville and Fauquier loams, 8 to 15 percent slopes, moderately eroded	80	IIIe–4	19
MkD2	Myersville and Fauquier loams, 15 to 25 percent slopes, moderately eroded	81	IVe–3	24
MkE2	Myersville and Fauquier loams, 25 to 45 percent slopes, moderately eroded	81	VIe–2	27
MkE3	Myersville and Fauquier loams, 25 to 50 percent slopes, severely eroded	81	VIIs–3	30
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GUIDE TO MAPPING UNITS AND CAPABILITY UNITS—Continued

Map symbol	Mapping unit	Page	Capability unit	Page
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MmC2	Myersville and Fauquier silt loams, 8 to 15 percent slopes, moderately eroded	81	IIIe–4	19
MmD2	Myersville and Fauquier silt loams, 15 to 25 percent slopes, moderately eroded	81	IVe–3	24
MnC3	Myersville and Fauquier silty clay loams, 8 to 15 percent slopes, severely eroded	81	VIe–2	27
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MoE	Myersville and Fauquier very stony loams, 35 to 50 percent slopes	81	VIIs–3	30
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NaB2	Norton gravelly silt loam, 3 to 8 percent slopes, moderately eroded	82	IIe–4	15
NaC2	Norton gravelly silt loam, 8 to 15 percent slopes, moderately eroded	82	IIIe–4	19
NaD2	Norton gravelly silt loam, 15 to 25 percent slopes, moderately eroded	82	IVe–3	24
NaE2	Norton gravelly silt loam, 25 to 45 percent slopes, moderately eroded	82	VIe–2	27
NbB	Norton very stony loam, 3 to 8 percent slopes	82	VIs–2	28
PaB2	Penn gravelly loam, 0 to 8 percent slopes, moderately eroded	82	IIe–10	16
PaB3	Penn gravelly loam, 0 to 8 percent slopes, severely eroded	83	IIIe–10	20
PaC2	Penn gravelly loam, 8 to 15 percent slopes, moderately eroded	83	IIIe–10	20
PaC3	Penn gravelly loam, 8 to 15 percent slopes, severely eroded	83	IVe–10	25
PaD2	Penn gravelly loam, 15 to 25 percent slopes, moderately eroded	83	IVe–10	25
PbB2	Penn loam, 0 to 8 percent slopes, moderately eroded	83	IIe–10	16
PbC2	Penn loam, 8 to 15 percent slopes, moderately eroded	83	IIIe–10	20
PbC3	Penn loam, 8 to 15 percent slopes, severely eroded	83	IVe–10	25
PbD2	Penn loam, 15 to 25 percent slopes, moderately eroded	83	IVe 10	25
PcD3	Penn loam and gravelly loam, 15 to 25 percent slopes, severely eroded	83	VIe–3	27
PdB2	Penn shaly loam, 0 to 15 percent slopes, moderately eroded	83	IIIe–40	23
PdC3	Penn shaly loam, 3 to 15 percent slopes, severely eroded	83	VIe–3	27
PdD2	Penn shaly loam, 15 to 25 percent slopes, moderately eroded	83	VIe–3	27
PdD3	Penn shaly loam, 15 to 25 percent slopes, severely eroded	83	VIe–3	27
PeB2	Penn silt loam, 0 to 8 percent slopes, moderately eroded	83	IIe–10	16
PeB3	Penn silt loam, 3 to 8 percent slopes, severely eroded	83	IIIe–10	20
PeC2	Penn silt loam, 8 to 15 percent slopes, moderately eroded	83	IIIe–10	20
PeC3	Penn silt loam, 8 to 15 percent slopes, severely eroded	83	IVe 10	25
PgB4	Penn soils, 3 to 8 percent slopes, very severely eroded	83	VIIe–3	29
PgC4	Penn soils, 8 to 15 percent slopes, very severely eroded	83	VIIe–3	29
PgD4	Penn soils, 15 to 25 percent slopes, very severely eroded	83	VIIe–3	29
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PgE3	Penn soils, 25 to 50 percent slopes, severely eroded	83	VIIe–3	29
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RaA	Raritan silt loam, 0 to 3 percent slopes	84	IIw–1	18
RaB2	Raritan silt loam, 3 to 8 percent slopes, moderately eroded	84	IIIe–13	21
RbA	Readington silt loam, 0 to 3 percent slopes	85	IIIw 11	24
RbB2	Readington silt loam, 0 to 8 percent slopes, moderately eroded	85	IIIe–13	21
RcA	Roanoke silt loam, moderately deep over cobbles, 0 to 3 percent slopes	85	Vw–2	26
RdB	Rohrersville silt loam, 0 to 8 percent slopes	86	IIw–1	18
RdC2	Rohrersville silt loam, 3 to 15 percent slopes, moderately eroded	86	IIIe–13	21
Re	Rough stony land	86	VIIs–2	29
RgA	Rowland silt loam, 0 to 3 percent slopes	86	Vw–1	26
SaB2	Sequatchie sandy loam, neutral variant, 3 to 8 percent slopes, moderately eroded	87	IIe–5	16
SaC2	Sequatchie sandy loam, neutral variant, 8 to 15 percent slopes, moderately eroded	87	IIIe–5	20
TaB	Thurmont cobbly loam, 0 to 8 percent slopes	88	IIe–25	18
TbA	Thurmont gravelly and cobbly loams, 0 to 3 percent slopes	88	IIe–25	18
TcB2	Thurmont gravelly loam, 0 to 8 percent slopes, moderately eroded	88	IIe–25	18
TcC2	Thurmont gravelly loam, 8 to 15 percent slopes, moderately eroded	88	IIIe–25	22
TcD2	Thurmont gravelly loam, 15 to 25 percent slopes, moderately eroded	88	IVe–25	25
TdA	Thurmont silt loam, 0 to 3 percent slopes	88	I–4	13
TeC	Thurmont very stony loam, 0 to 15 percent slopes	88	VIs–2	28
UaA	Urbana silt loam, 0 to 3 percent slopes	89	IIIw–11	24
UaC2	Urbana silt loam, 3 to 15 percent slopes, moderately eroded	89	IIIe–13	21
UaC3	Urbana silt loam, 8 to 15 percent slopes, severely eroded	89	IVe–41	26
UaD2	Urbana silt loam, 15 to 25 percent slopes, moderately eroded	89	VIe–2	27
WaB	Watchung silt loam, 0 to 8 percent slopes	90	Vw–2	26
WbB2	Waynesboro gravelly loam, 0 to 8 percent slopes, moderately eroded	90	IIe–4	15
WbC2	Waynesboro gravelly loam, 8 to 15 percent slopes, moderately eroded	90	IIIe–4	19
WcA	Wehadkee silt loam, 0 to 3 percent slopes	91	VIw–1	28
WdB	Worsham silt loam, 0 to 8 percent slopes	91	Vw–2	26
WeB	Worsham very stony silt loam, 0 to 8 percent slopes	91	VIIs–4	30

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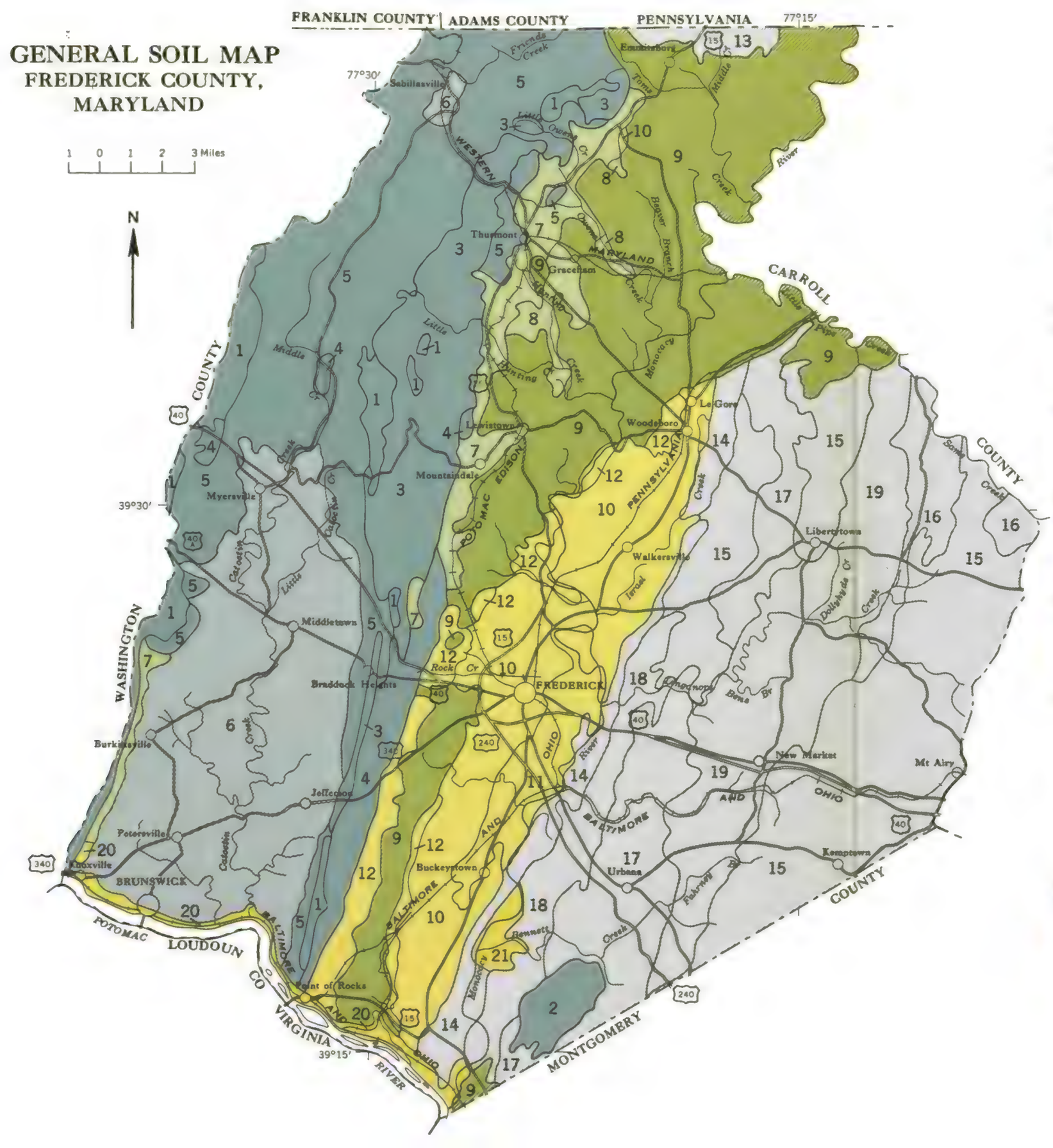
GENERAL SOIL MAP
FREDERICK COUNTY, MARYLAND



STONY OR STEEP, SHALLOW SOILS OF MOUNTAIN AND ELEVATED INTERMOUNTAIN AREAS:

1. Dekalb-Clymer.
2. Edgemont-Dekalb.
3. Edgemont-Chandler-Dekalb.
4. Chandler-Talladega.
5. Highfield-Fauquier.

ROLLING SOILS OF INTERMOUNTAIN VALLEYS:

6. Myersville-Fauquier-Catoctin.

SOILS OF COLLUVIAL FOOT SLOPES:

7. Braddock-Thurmont-Augusta.
8. Norton.

MOSTLY SHALLOW SOILS OF VALLEYS OF RED SHALE AND SANDSTONE:

9. Penn-Readington-Croton.

SOILS OF LIMESTONE VALLEYS:

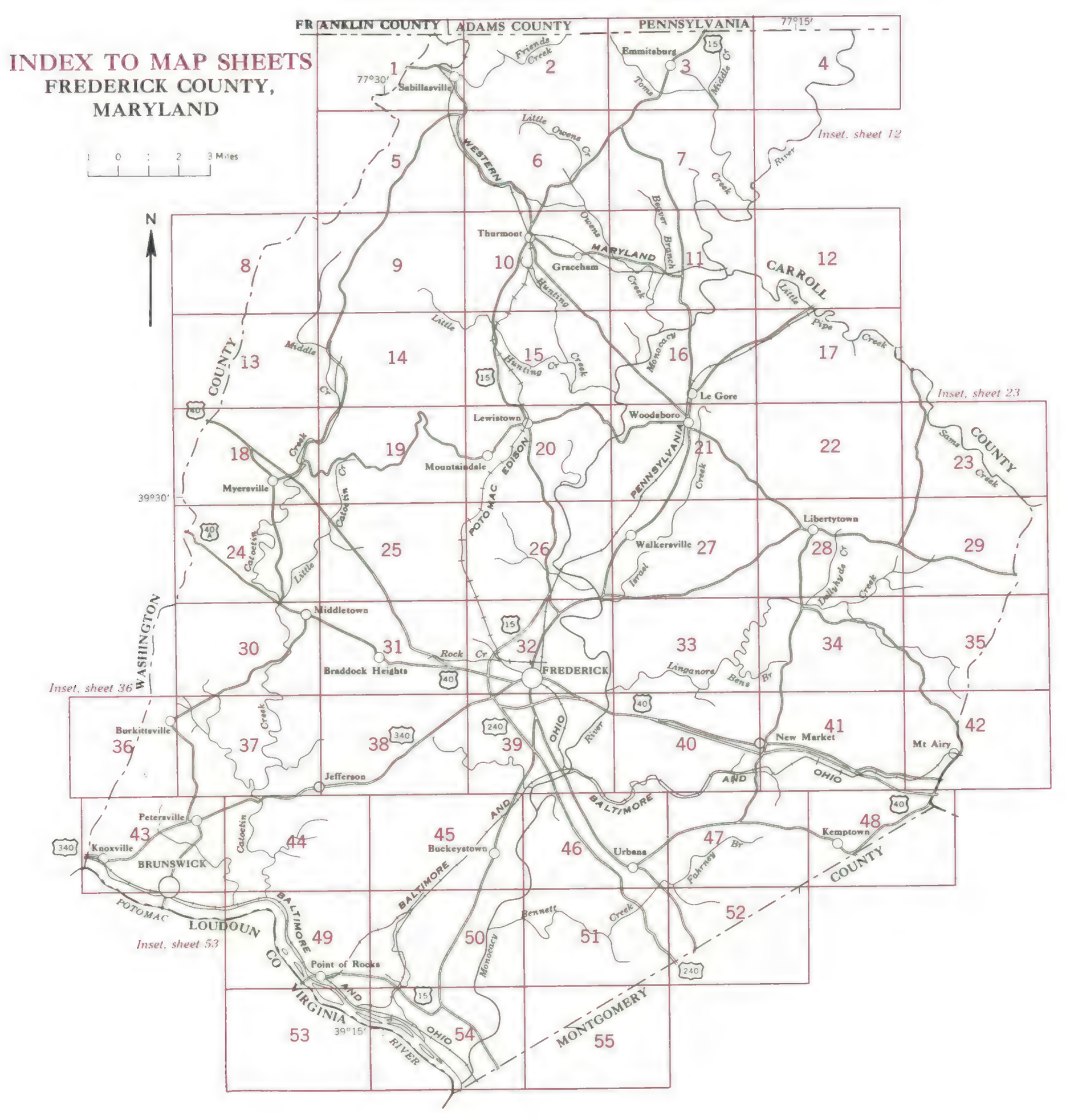
10. Duffield-Hagerstown.
11. Sequatchie-Hagerstown.
12. Athol.

SOILS OF THE PIEDMONT PLATEAU:

13. Montalto-Lehigh-Watchung.
14. Cardiff.
15. Manor-Glenelg.
16. Conestoga-Manor.
17. Manor-Edgemont-Brandywine.
18. Manor-Linganore-Montalto.
19. Manor-Linganore-Urbana.

SOILS OF RIVER TERRACES AND FLOOD PLAINS:

20. Waynesboro-Captina-Huntington
21. Elk-Captina-Huntington.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39°30'
39°15'
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Emmitsburg
Thurmont
Graceham
Lewistown
Woodsboro
Le Gore
Mountaindale
Myersville
Walkersville
Libertytown
Middletown
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FREDERICK
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Little Owens Cr
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Catoctin Creek
Little Catoctin Cr
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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FREDERICK COUNTY, MARYLAND

MARYLAND AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

SYMBOL	NAME
Aa	Alluvial land
AtA	Athol gravelly loam, 0-3 percent slopes
AtB2	Athol gravelly loam, 3-8 percent slopes, moderately eroded
AtC2	Athol gravelly loam, 8-15 percent slopes, moderately eroded
AtD2	Athol gravelly loam, 15-25 percent slopes, moderately eroded
AvB2	Athol rocky loam, 0-15 percent slopes, moderately eroded
AdA	Augusta gravelly loam, 0-3 percent slopes
AdB2	Augusta gravelly loam, 3-15 percent slopes, moderately eroded
AeB	Augusta silt loam, 0-8 percent slopes
AgB	Augusta very stony loam, 0-8 percent slopes
BaA	Bermudian fine sandy loam, 0-3 percent slopes
BbA	Bermudian silt loam, 0-3 percent slopes
BcA	Birdsboro silt loam, 0-3 percent slopes
BcB2	Birdsboro silt loam, 3-8 percent slopes, moderately eroded
BdB	Bowmansville silt loam, 0-8 percent slopes
BeB	Braddock cobbly loam, 3-8 percent slopes
BgB2	Braddock gravelly loam, 3-8 percent slopes, moderately eroded
BhC2	Braddock gravelly and cobbly loams, 8-15 percent slopes, moderately eroded
BkB	Braddock very stony loam, 3-15 percent slopes
BmD2	Braddock soils, 15-25 percent slopes, moderately eroded
BnB2	Brandywine gravelly loam, 0-15 percent slopes, moderately eroded
BnD2	Brandywine gravelly loam, 15-25 percent slopes, moderately eroded
BnE2	Brandywine gravelly loam, 15-55 percent slopes, severely eroded
BoA	Bucks silt loam, 0-3 percent slopes
BoB2	Bucks silt loam, 3-8 percent slopes, moderately eroded
CaB2	Captina silt loam, 0-8 percent slopes, moderately eroded
CbB2	Cardiff channery loam, 0-8 percent slopes, moderately eroded
CbC2	Cardiff channery loam, 8-15 percent slopes, moderately eroded
CbC3	Cardiff channery loam, 8-15 percent slopes, severely eroded
CbD2	Cardiff channery loam, 15-25 percent slopes, moderately eroded
CbD3	Cardiff channery loam, 15-25 percent slopes, severely eroded
CbE2	Cardiff channery loam, 25-45 percent slopes, moderately eroded
CbE3	Cardiff channery loam, 15-55 percent slopes, very severely eroded
CbF2	Cardiff channery loam, 45-55 percent slopes, moderately eroded
CcB2	Catoctin channery silt loam, 0-10 percent slopes, moderately eroded
CcC2	Catoctin channery silt loam, 10-20 percent slopes, moderately eroded
CcC3	Catoctin channery silt loam, 10-20 percent slopes, severely eroded
CcD2	Catoctin channery silt loam, 20-35 percent slopes, moderately eroded
CcD3	Catoctin channery silt loam, 20-35 percent slopes, severely eroded
CcE4	Catoctin channery silt loam, 20-55 percent slopes, very severely eroded
CcF2	Catoctin channery silt loam, 35-55 percent slopes, moderately eroded
CdA	Chalfont silt loam, 0-3 percent slopes
CdB	Chalfont silt loam, 3-15 percent slopes
CeB2	Chandler and Talladega channery loams, 0-10 percent slopes, moderately eroded
CeC2	Chandler and Talladega channery loams, 10-20 percent slopes, moderately eroded
CeD2	Chandler and Talladega channery loams, 20-35 percent slopes, moderately eroded
CeD3	Chandler and Talladega channery loams, 20-35 percent slopes, severely eroded
CeE2	Chandler and Talladega channery loams, 35-45 percent slopes, moderately eroded
CgB2	Chandler and Talladega silt loams, 0-10 percent slopes, moderately eroded
CgC2	Chandler and Talladega silt loams, 10-20 percent slopes, moderately eroded
CgD2	Chandler and Talladega silt loams, 20-35 percent slopes, moderately eroded
CgD3	Chandler and Talladega silt loams, 20-35 percent slopes, severely eroded
ChC2	Chandler and Talladega very stony loams, 0-20 percent slopes, moderately eroded
ChD2	Chandler and Talladega very stony loams, 20-45 percent slopes, moderately eroded
CkA2	Chester loam, 0-3 percent slopes, moderately eroded
CkB2	Chester loam, 3-8 percent slopes, moderately eroded
CkC2	Chester loam, 8-15 percent slopes, moderately eroded
CmA	Chewacla silt loam, 0-3 percent slopes
CnB	Clymer very stony loam, 0-20 percent slopes
CoA	Colbert silt loam, deep variant, 0-3 percent slopes
CpB2	Conestoga silt loam, 0-8 percent slopes, moderately eroded
CpC2	Conestoga silt loam, 8-15 percent slopes, moderately eroded
CpD2	Conestoga silt loam, 15-25 percent slopes, moderately eroded
CrA	Congaree silt loam, 0-3 percent slopes
CsA	Congaree silt loam, local alluvium, 0-3 percent slopes
CsB	Congaree silt loam, local alluvium, 3-8 percent slopes
CtB	Croton silt loam, overwashed, 0-8 percent slopes
DaB2	Dekalb loam, 0-10 percent slopes, moderately eroded
DaC2	Dekalb loam, 10-20 percent slopes, moderately eroded
DbC	Dekalb very stony loam, 0-35 percent slopes
DcA	Duffield silt loam, 0-3 percent slopes
DdA2	Duffield and Frankstown shaly silt loams, 0-3 percent slopes, moderately eroded
DdB2	Duffield and Frankstown shaly silt loams, 3-8 percent slopes, moderately eroded
DdC2	Duffield and Frankstown shaly silt loams, 8-15 percent slopes, moderately eroded
DeA	Duffield and Frankstown silt loams, 0-3 percent slopes
DeB2	Duffield and Frankstown silt loams, 3-8 percent slopes, moderately eroded
DeC2	Duffield and Frankstown silt loams, 8-15 percent slopes, moderately eroded
DeD2	Duffield and Frankstown silt loams, 15-25 percent slopes, moderately eroded
EaB2	Edgemont gravelly loam, 0-8 percent slopes, moderately eroded
EaC2	Edgemont gravelly loam, 8-15 percent slopes, moderately eroded
EaD2	Edgemont gravelly loam, 15-25 percent slopes, moderately eroded
EaE	Edgemont gravelly loam, 25-45 percent slopes
EbC	Edgemont very stony loam, 0-20 percent slopes
EbF	Edgemont very stony loam, 20-60 percent slopes
EcB2	Edgemont-Chandler channery loams, 0-10 percent slopes, moderately eroded
EcC2	Edgemont-Chandler channery loams, 10-20 percent slopes, moderately eroded
EcC3	Edgemont-Chandler channery loams, 10-20 percent slopes, severely eroded
EcD2	Edgemont-Chandler channery loams, 20-35 percent slopes, moderately eroded
EcD3	Edgemont-Chandler channery loams, 20-35 percent slopes, severely eroded
EdC	Edgemont-Chandler very stony loams, 0-20 percent slopes
EdE	Edgemont-Chandler very stony loams, 20-60 percent slopes
EeB2	Elioak gravelly loam, 3-8 percent slopes, moderately eroded
EeC2	Elioak gravelly loam, 8-15 percent slopes, moderately eroded
EgA2	Elioak silt loam, 0-3 percent slopes, moderately eroded
EgB2	Elioak silt loam, 3-8 percent slopes, moderately eroded
EhB2	Elk gravelly loam, 3-8 percent slopes, moderately eroded
ExA	Elk loam, 0-3 percent slopes
ExB2	Elk loam, 3-8 percent slopes, moderately eroded
ExC2	Elk loam, 8-15 percent slopes, moderately eroded
FaA	Fauquier gravelly loam, 0-3 percent slopes
FaB2	Fauquier gravelly loam, 3-10 percent slopes, moderately eroded
FaC2	Fauquier gravelly loam, 10-20 percent slopes, moderately eroded
FaD2	Fauquier gravelly loam, 20-35 percent slopes, moderately eroded
FaE3	Fauquier gravelly loam, 20-45 percent slopes, severely eroded
FbA	Fauquier loam, 0-3 percent slopes
FbB2	Fauquier loam, 3-8 percent slopes, moderately eroded
FbC2	Fauquier loam, 8-15 percent slopes, moderately eroded
FcC2	Fauquier loam, shallow, 8-15 percent slopes, moderately eroded
FcE2	Fauquier loam, shallow, 15-45 percent slopes, moderately eroded
FdA	Fauquier silt loam, 0-3 percent slopes
FdB2	Fauquier silt loam, 0-10 percent slopes, moderately eroded
FdC2	Fauquier silt loam, 10-20 percent slopes, moderately eroded
FdD2	Fauquier silt loam, 20-35 percent slopes, moderately eroded
FeC4	Fauquier silty clay loam, 10-20 percent slopes, very severely eroded
FeD3	Fauquier silty clay loam, 20-35 percent slopes, severely eroded
FeD4	Fauquier silty clay loam, 20-45 percent slopes, very severely eroded
FgC2	Fauquier very stony loam, 0-20 percent slopes, moderately eroded
FgE2	Fauquier very stony loam, 20-50 percent slopes, moderately eroded
GaB2	Glenelg gravelly loam, 0-8 percent slopes, moderately eroded
GaC2	Glenelg gravelly loam, 8-15 percent slopes, moderately eroded
GaD2	Glenelg gravelly loam, 15-25 percent slopes, moderately eroded
GaD3	Glenelg gravelly loam, 15-25 percent slopes, severely eroded
GaE4	Glenelg gravelly loam, 15-45 percent slopes, very severely eroded
GbB2	Glenelg and Chester loams, 3-8 percent slopes, moderately eroded
GbC2	Glenelg and Chester loams, 8-15 percent slopes, moderately eroded
GbD2	Glenelg and Chester loams, 15-25 percent slopes, moderately eroded
GcA2	Glenelg and Chester silt loams, 0-3 percent slopes, moderately eroded
GcB2	Glenelg and Chester silt loams, 3-8 percent slopes, moderately eroded
GcC2	Glenelg and Chester silt loams, 8-15 percent slopes, moderately eroded
GcD2	Glenelg and Chester silt loams, 15-45 percent slopes, moderately eroded
GdB	Glenville silt loam, 0-8 percent slopes
GdB2	Glenville silt loam, 3-8 percent slopes, moderately eroded
GeB	Glenville very stony silt loam, 0-8 percent slopes
GgA	Guthrie silt loam, 0-3 percent slopes
HaA	Hagerstown gravelly loam, 0-3 percent slopes
HaB2	Hagerstown gravelly loam, 3-8 percent slopes, moderately eroded
HaC2	Hagerstown gravelly loam, 8-15 percent slopes, moderately eroded
HbA	Hagerstown loam, 0-3 percent slopes
HbB2	Hagerstown loam, 0-8 percent slopes, moderately eroded
HbC2	Hagerstown loam, 8-15 percent slopes, moderately eroded
HbD2	Hagerstown loam, 15-25 percent slopes, moderately eroded
HcC3	Hagerstown rocky clay, 8-15 percent slopes, severely eroded
HcD3	Hagerstown rocky clay, 15-25 percent slopes, severely eroded
HdB2	Hagerstown rocky loam, 3-15 percent slopes, moderately eroded
HeA	Hagerstown silt loam, 0-3 percent slopes
HeB2	Hagerstown silt loam, 3-8 percent slopes, moderately eroded
HeC2	Hagerstown silt loam, 8-15 percent slopes, moderately eroded
HgB2	Highfield channery loam, 0-10 percent slopes, moderately eroded
HgC2	Highfield channery loam, 10-20 percent slopes, moderately eroded
HgD2	Highfield channery loam, 20-35 percent slopes, moderately eroded
HgD3	Highfield channery loam, 20-35 percent slopes, severely eroded
HgD4	Highfield channery loam, 20-35 percent slopes, very severely eroded
HgE3	Highfield channery loam, 35-45 percent slopes, moderately and severely eroded
HmB2	Highfield silt loam, 0-10 percent slopes, moderately eroded
HmC2	Highfield silt loam, 10-20 percent slopes, moderately eroded
HmD3	Highfield silt loam, 20-35 percent slopes, severely eroded
HnC	Highfield very stony loam, 0-20 percent slopes
HnE	Highfield very stony loam, 20-45 percent slopes
HnA	Huntington fine sandy loam, 0-3 percent slopes
HoA	Huntington silt loam, 0-3 percent slopes
HpA	Huntington silt loam, local alluvium, 0-3 percent slopes
LaB	Lantz silt loam, 0-8 percent slopes
LbC	Lantz very stony loam, 0-15 percent slopes
LcB2	Legore gravelly silty clay loam, 0-15 percent slopes, moderately eroded
LcD2	Legore gravelly silty clay loam, 15-25 percent slopes, moderately eroded
LdB2	Legore silty clay loam, 0-15 percent slopes, moderately eroded
LeB	Legore very stony clay loam, 0-15 percent slopes
LeE	Legore very stony clay loam, 15-50 percent slopes
LgC2	Lehigh slaty loam, 3-15 percent slopes, moderately eroded
LhC4	Lehigh slaty silty clay loam, 3-15 percent slopes, very severely eroded
LkA	Lindside silt loam, 0-3 percent slopes
LmA	Lindside silt loam, local alluvium, 0-3 percent slopes
LmB	Lindside silt loam, local alluvium, 3-8 percent slopes
LnB2	Linganore channery and gravelly loams, 0-15 percent slopes, moderately eroded
LnD2	Linganore channery and gravelly loams, 15-25 percent slopes, moderately eroded
LoB3	Linganore channery and gravelly silt loams, 3-15 percent slopes, severely eroded
LoD3	Linganore channery and gravelly silt loams, 15-25 percent slopes, severely and very severely eroded
LoE3	Linganore channery and gravelly silt loams, 25-55 percent slopes, severely eroded
LpC	Linganore very stony loam, 3-55 percent slopes
MaB2	Manor channery and gravelly loams, 0-8 percent slopes, moderately eroded
MaC2	Manor channery and gravelly loams, 8-15 percent slopes, moderately eroded
MaC3	Manor channery and gravelly loams, 8-15 percent slopes, severely eroded
MaD2	Manor channery and gravelly loams, 15-25 percent slopes, moderately eroded
MaD3	Manor channery and gravelly loams, 15-25 percent slopes, severely eroded
MaD4	Manor channery and gravelly loams, 15-25 percent slopes, very severely eroded
MaE2	Manor channery and gravelly loams, 25-45 percent slopes, moderately eroded
MaE3	Manor channery and gravelly loams, 25-55 percent slopes, severely and very severely eroded
MbC	Manor very stony loam, 3-15 percent slopes
MbE	Manor very stony loam, 15-55 percent slopes
McA	Melvin silt loam, 0-3 percent slopes
MdB2	Montalto silty clay loam, 0-8 percent slopes, moderately eroded
MdC2	Montalto silty clay loam, 8-15 percent slopes, moderately eroded
MdD2	Montalto silty clay loam, 15-25 percent slopes, moderately eroded
MeB2	Montalto very stony clay loam, 0-15 percent slopes, moderately eroded
MeD	Montalto very stony clay loam, 15-45 percent slopes
MgD4	Myersville and Fauquier clay loams, 15-25 percent slopes, very severely eroded
MhA	Myersville and Fauquier gravelly loams, 0-3 percent slopes
MhB2	Myersville and Fauquier gravelly loams, 3-8 percent slopes, moderately eroded
MhC2	Myersville and Fauquier gravelly loams, 8-15 percent slopes, moderately eroded
MkA	Myersville and Fauquier loams, 0-3 percent slopes
MkB2	Myersville and Fauquier loams, 3-8 percent slopes, moderately eroded
MkC2	Myersville and Fauquier loams, 8-15 percent slopes, moderately eroded
MkD2	Myersville and Fauquier loams, 15-25 percent slopes, moderately eroded
MkE2	Myersville and Fauquier loams, 25-45 percent slopes, moderately eroded
MkE3	Myersville and Fauquier loams, 25-50 percent slopes, severely eroded
MmA	Myersville and Fauquier silt loams, 0-3 percent slopes
MmB2	Myersville and Fauquier silt loams, 3-8 percent slopes, moderately eroded
MmC2	Myersville and Fauquier silt loams, 8-15 percent slopes, moderately eroded
MmD2	Myersville and Fauquier silt loams, 15-25 percent slopes, moderately eroded
MnC3	Myersville and Fauquier silty clay loams, 8-15 percent slopes, severely eroded
MoC	Myersville and Fauquier very stony loams, 3-35 percent slopes
MoE	Myersville and Fauquier very stony loams, 35-50 percent slopes
MtA	Made land
NaA	Norton gravelly silt loam, 0-3 percent slopes
NaB2	Norton gravelly silt loam, 3-8 percent slopes, moderately eroded
NaC2	Norton gravelly silt loam, 8-15 percent slopes, moderately eroded
NaD2	Norton gravelly silt loam, 15-25 percent slopes, moderately eroded
NaE2	Norton gravelly silt loam, 25-45 percent slopes, moderately eroded
NbB	Norton very stony loam, 3-8 percent slopes
PaB2	Penn gravelly loam, 0-8 percent slopes, moderately eroded
PaB3	Penn gravelly loam, 0-8 percent slopes, severely eroded
PaC2	Penn gravelly loam, 8-15 percent slopes, moderately eroded
PaC3	Penn gravelly loam, 8-15 percent slopes, severely eroded
PaD2	Penn gravelly loam, 15-25 percent slopes, moderately eroded
PbB2	Penn loam, 0-8 percent slopes, moderately eroded
PbC2	Penn loam, 8-15 percent slopes, moderately eroded
PbC3	Penn loam, 8-15 percent slopes, severely eroded
PbD2	Penn loam, 15-25 percent slopes, moderately eroded
PcD3	Penn loam and gravelly loam, 15-25 percent slopes, severely eroded
PdB2	Penn shaly loam, 0-15 percent slopes, moderately eroded
PdC3	Penn shaly loam, 3-15 percent slopes, severely eroded
PdD2	Penn shaly loam, 15-25 percent slopes, moderately eroded
PdD3	Penn shaly loam, 15-25 percent slopes, severely eroded
PeB2	Penn silt loam, 0-8 percent slopes, moderately eroded
PeB3	Penn silt loam, 3-8 percent slopes, severely eroded
PeC2	Penn silt loam, 8-15 percent slopes, moderately eroded
PeC3	Penn silt loam, 8-15 percent slopes, severely eroded
PgB4	Penn soils, 3-8 percent slopes, very severely eroded
PgC4	Penn soils, 8-15 percent slopes, very severely eroded
PgD4	Penn soils, 15-25 percent slopes, very severely eroded
PgE2	Penn soils, 25-50 percent slopes, moderately eroded
PgE3	Penn soils, 25-50 percent slopes, severely eroded
PhB2	Penn-Lansdale loams, 0-8 percent slopes, moderately eroded
PhC2	Penn-Lansdale loams, 8-15 percent slopes, moderately eroded
PhC3	Penn-Lansdale loams, 8-15 percent slopes, severely eroded
PhD2	Penn-Lansdale loams, 15-25 percent slopes, moderately eroded
PhD3	Penn-Lansdale loams, 15-25 percent slopes, severely eroded
RaA	Raritan silt loam, 0-3 percent slopes
RaB2	Raritan silt loam, 3-8 percent slopes, moderately eroded
RbA	Readington silt loam, 0-3 percent slopes
RbB2	Readington silt loam, 0-8 percent slopes, moderately eroded
RcA	Roanoke silt loam, moderately deep over cobbles, 0-3 percent slopes
RdB	Rohrersville silt loam, 0-8 percent slopes
RdC2	Rohrersville silt loam, 3-15 percent slopes, moderately eroded
Re	Rough stony land
RgA	Rowland silt loam, 0-3 percent slopes
SaB2	Sequatchie sandy loam, neutral variant, 3-8 percent slopes, moderately eroded
SaC2	Sequatchie sandy loam, neutral variant, 8-15 percent slopes, moderately eroded
TaB	Thurmont cobbly loam, 0-8 percent slopes
TbA	Thurmont gravelly and cobbly loams, 0-3 percent slopes
TcB2	Thurmont gravelly loam, 0-8 percent slopes, moderately eroded
TcC2	Thurmont gravelly loam, 8-15 percent slopes, moderately eroded
TcD2	Thurmont gravelly loam, 15-25 percent slopes, moderately eroded
TdA	Thurmont silt loam, 0-3 percent slopes
TeC	Thurmont very stony loam, 0-15 percent slopes
UaA	Urbana silt loam, 0-3 percent slopes
UaC2	Urbana silt loam, 3-15 percent slopes, moderately eroded
UaC3	Urbana silt loam, 8-15 percent slopes, severely eroded
UaD2	Urbana silt loam, 15-25 percent slopes, moderately eroded
WaB	Watchung silt loam, 0-8 percent slopes
WbB2	Waynesboro gravelly loam, 0-8 percent slopes, moderately eroded
WbC2	Waynesboro gravelly loam, 8-15 percent slopes, moderately eroded
WcA	Wehadkee silt loam, 0-3 percent slopes
WdB	Worsham silt loam, 0-8 percent slopes
WeB	Worsham very stony silt loam, 0-8 percent slopes

Soils surveyed 1939-57 by M. F. Hershberger, L. W. Ilgen, F. G. Loughry, R. S. Long, J. E. McDonald, R. W. Mayo, Leonard Newman, J. B. Rayburn, J. D. Sheetz, David C. Taylor, and Snyder Von Day, Soil Conservation Service. Correlation by Morris E. Austin, Soil Conservation Service.

Soil map constructed 1958 by Cartographic Division, Soil Conservation Service, USDA, from 1952 aerial photographs. Controlled mosaic based on Maryland plane coordinate system, state zone, Lambert conformal conic projection, 1927 North American datum.

FREDERICK COUNTY, MARYLAND

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads

- Good motor
- Poor motor
- Trail
- Marker, U. S. (33)

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail, foot
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

- School
- Church
- Station

Mine and Quarry

- Shaft
- Dump
- Prospect

Pits, gravel or other

Power line

Pipeline

Cemetery

Dam

Levee

Tank

Oil well

Windmill

Canal lock (point upstream)

BOUNDARIES

- National or state
- County
- Township, civil
- Township, U. S.
- Section line, corner
- City (corporate)
- Reservation
- Land grant

DRAINAGE

Streams

- Perennial
- Intermittent, unclass.
- Crossable with tillage implements
- Not crossable with tillage implements

Canals and ditches (CANAL / DITCH)

Lakes and ponds

- Perennial
- Intermittent
- Fish ponds

Springs

Marsh

Wet spot

RELIEF

Escarpments

- Bedrock
- Other

Prominent peaks

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil type outline and symbol (Dx)
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land

Erosion

- Severely eroded spot
- Wind, moderate
- Wind, severe
- Blowout
- Wind hummock
- Overblown soil

Gullies

FREDERICK COUNTY, MARYLAND - SHEET NUMBER 1

(Joins sheet 2)

(Joins sheet 5)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

N

1

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1952

(2)

N

(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 6)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 7)

4

N

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 1)

(Joins sheet 6)

(Joins sheet 9)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 2)

N

H A U V E R S

E M M I T S B U R G

Little Piney Mountain

P I N E Y M O U N T A I N

T H U R M O N T

C A T O C T I N

R E C R E A T I O N A L

D E M O N S T R A T I O N

A R E A

Owens Creek

Flint Creek

Western Maryland

Roddy

Fish Hatchery

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 10)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 3)

(Joins sheet 6)

(Joins inset, sheet 12)

(Joins sheet 11)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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8

N

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 5)

N

WASHINGTON COUNTY

H A U V E R S

C A T O C T I N

C A T O C T I N M O U N T A I N R E C R E A T I O N A R E A

T H U R M O N T

D E M O N S T R A T I O N

Cunningham Falls

Middle Creek

Spruce Creek

Hunting Creek

Little Hunting Creek

Phillips Delight School

Buzzard Flats

Bobs Hill

Black Rock

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 14)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 6)

N

Wolf Rock

CATOCTIN RECREATIONAL DEMONSTRATION AREA

Chimney Rock

Hunting Creek

Cat Rock

Thurmont

Apples Church

FISH HATCHERY

Owens Creek

WESTERN MARYLAND

Graceham

FISH PONDS

EDISON

FISH PONDS

Hunting Creek

POTOMAC

Blue Mountain

Jimtown

CREAGERSTOWN

High Run

Bruceys Run

(Joins sheet 9)

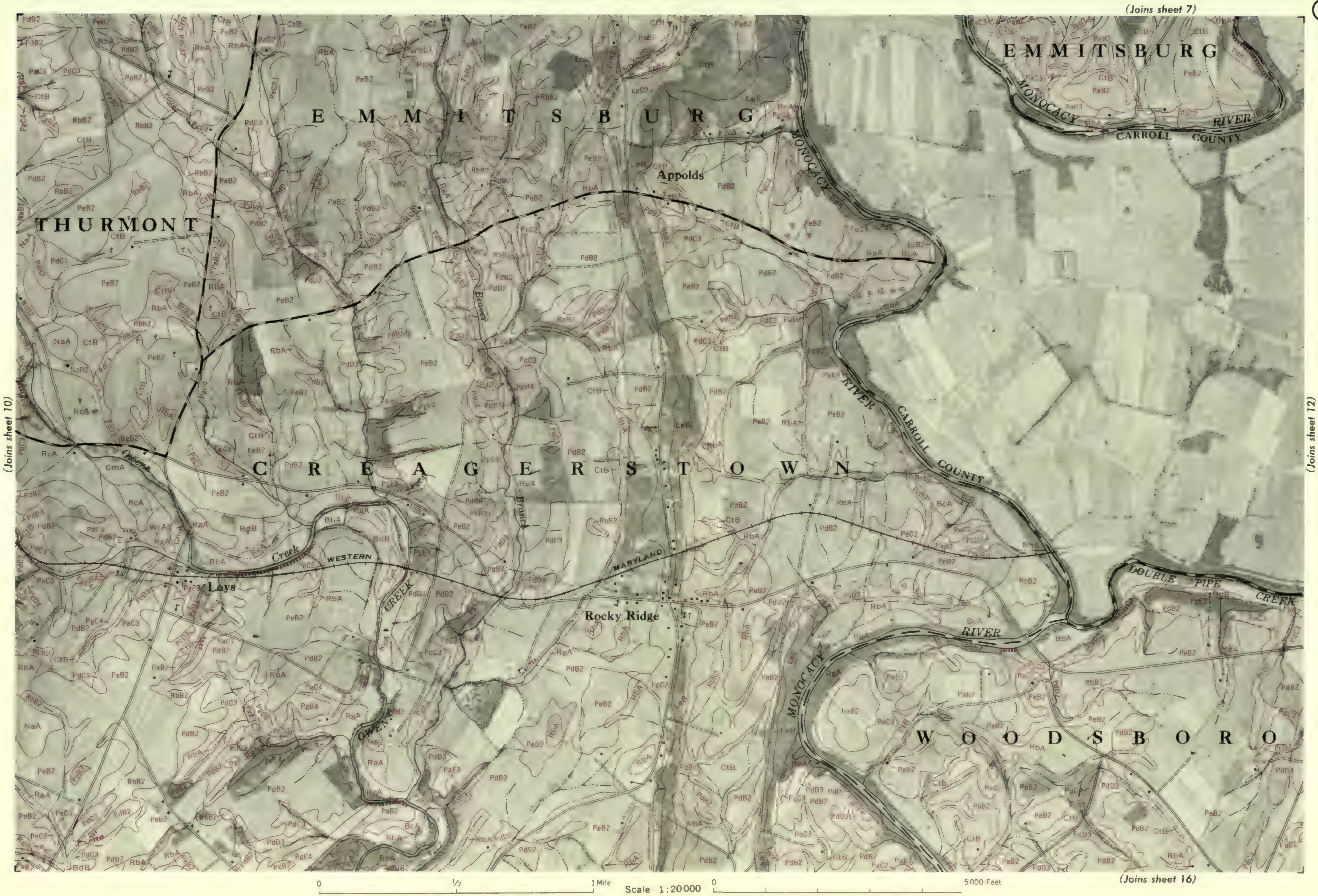
(Joins sheet 11)

(Joins sheet 15)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1952

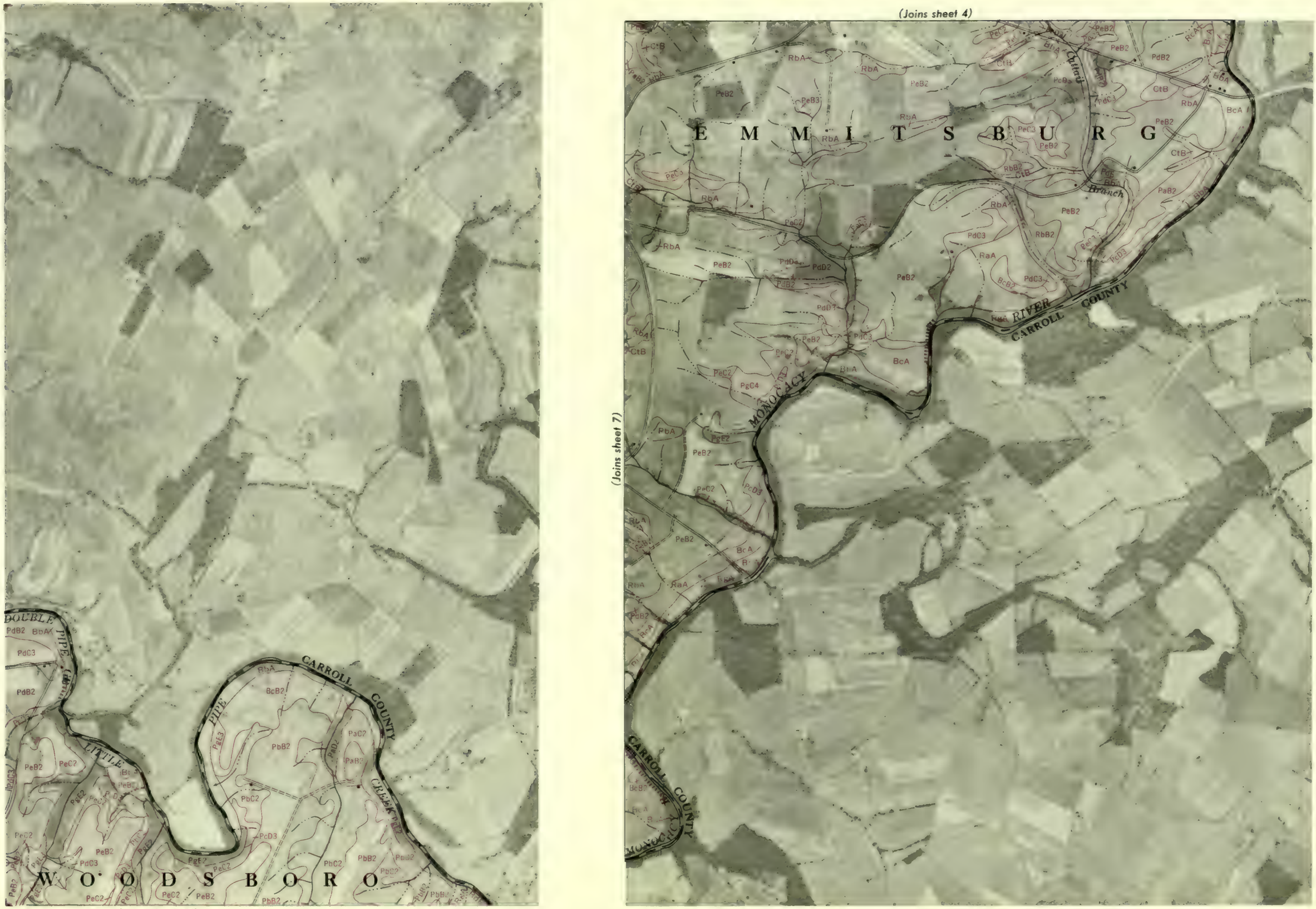
12

N

(Joins sheet 11)

(Joins sheet 4)

(Joins sheet 7)



(Joins sheet 17)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 8)

13

N

(Joins sheet 14)

(Joins sheet 18)

(Joins sheet 9)

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 19)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Joins sheet 10)

15

N

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 20)

CATOCTIN RECREATIONAL DEMONSTRATION AREA

THURMONT

GREAGERSTOWN

LEWISTOWN

Red Hill Station

Catoctin Furnace

Creagerstown Station

Creagerstown

FISH PONDS

FISH PONDS

Little Hunting Creek

Hunting Creek

Hunting Creek

Hunting Creek

POTOMAC

EDISON

Run

Creek

Creek

Run

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 11)

N

C R E A G E R S T O W N

W O O D S B O R O

OWENS CREEK

MONOCACY RIVER

PENNSYLVANIA

JOHNSVILLE

Oak Hill Church

New Midway

Troutville

Le Gore

Broad Run

Hunting Cr

(Joins sheet 15)

(Joins sheet 17)

(Joins sheet 21)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 12)

N

(Joins sheet 16)

(Joins inset, sheet 23)

WOODSBORO

Mt Zion Church

Ladiesburg

JOHNSVILLE

BUCKEYS MILL

CARROLL COUNTY

PIPE CREEK

Friendship

Beaver Dam Church

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 22)

(Joins sheet 13)

FREDERICK COUNTY, MARYLAND - SHEET NUMBER 18

N

(Joins sheet 19)

(Joins sheet 24)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 14)

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 25)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 15)

N

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 26)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 16)

21

N

CREAGERSTOWN

LEWISTOWN

Chestnut Hill

Woodsboro

Rock Hill Church

FISH HATCHERY

MT HOPE CEMETERY

W O O D S B O R O

W A L K E R S V I L L E

L I B E R T Y

Israel Creek

Glade Creek

Pennsylvania

Laurel Hill

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 27)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 17)

N

(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 28)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Inset right)

(Joins sheet 22)

(Joins sheet 17)

(Joins sheet 29)

Clemsonville

JOHNSVILLE

LANGANORE

Edgewood

CARROLL COUNTY

Hughes

Sams

Creek

Hames

Branch

Clemson

N

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

FREDERICK COUNTY, MARYLAND - SHEET NUMBER 24

(Joins sheet 18)

N

(Joins sheet 30)

(Joins sheet 25)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 19)

(Joins sheet 24)

(Joins sheet 26)

(Joins sheet 31)

CITY OF FREDERICK

APPROXIMATE BOUNDARY

MUNICIPAL FOREST

Hollow

APPROXIMATE BOUNDARY

Harmony

JACKSON

GAMBRILL STATE PARK

Clifford

Hawbottom

MIDDLETOWN

High Knob

Edgewood

Yellow Springs

Charlesville Sta

Indian Springs Station

Little Pipe Creek

Carroll Creek

Hollow Road

POTOMAC

EDISON

TUSCARORA MOUNTAIN

N

Scale 1:20000

0 1 Mile

0 5000 Feet

(Joins sheet 20)

N

L E W I S T O W N

T U S C A R O R A

F R E D E R I C K

W A L K E R S V I L L E

Hansonville

Charlesville

Bloomfield

Indian Springs

Fountain Rock

Harmony Grove

Ceresville

Muddy Creek

Tuscarora Creek

Little Tuscarora Creek

Glade Creek

POTOMAC EDISON

POTOMAC EDISON

MONOCACY RIVER

PENNSYLVANIA

15

(Joins sheet 25)

(Joins sheet 27)

(Joins sheet 32)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 21)

(Joins sheet 26)

(Joins sheet 28)

N

Walkersville

Daysville

LIBERTY

WALKERSVILLE

Israel

Laurel Hill

Gabbage Run

Walkersville Reservoir

Chestnut Grove

MT PLEASANT

Mount Pleasant

PENNSYLVANIA

Glade Creek

Israel Creek

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 33)

(Joins sheet 22)

N

(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 34)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 23)

(Joins sheet 28)

N

Sams Creek

Oak Orchard

LINGANORE

Weldon

CARROLL COUNTY

WOODVILLE

Creek

Weldon

Linganore

Talbot

Branch

(Joins sheet 35)

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 24)

N

Lambs Knoll

Spoolsville

Middletown

MIDDLETOWN

BURKITTSVILLE

JEFFERSON

Arnoldtown

Middletown Valley

Broad Creek

CATOCTIN CREEK

Middle Creek

Bush Creek

Branch

(Joins inset, sheet 36)

(Joins sheet 31)

(Joins sheet 37)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 25)

31

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. The map compiled from aerial photograph flown in [illegible].

(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 38)

Scale 1:20 000

32

(Joins sheet 26)

N

(Joins sheet 31)

(Joins sheet 33)

(Joins sheet 39)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 27)

N

(Joins sheet 32)

(Joins sheet 34)

M T P L E A S A N T

N E W M A R K E T

Israel Cr.

Addison Run

Mt Zion Church

McKaig

Creek

LINGANORE CREEK

Linganore

Bennett Branch

Bennett Run

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 40)

34

(Joins sheet 28)

N

(Joins sheet 33)

(Joins sheet 35)

(Joins sheet 41)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 29)

N

LINGANORE

WOODVILLE

McDonald

Harrisville

Woodville

Talbot

Branch

South Fork

Linganore Creek

CARROLL COUNTY

(Joins sheet 34)

(Joins sheet 42)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

This is one of a set of maps prepared by the U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report write the Soil Conservation Service U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photograph flown in 1951.

N

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 30)

37

N

MIDDLETOWN

Pleasant View Church

Broad Run

CATOCTIN CREEK

B U R K I T T S V I L L E

J E F F E R S O N

P E T E R S V I L L E

Jefferson

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 43)

½ (Joins sheet 44)

0 1 Mile

Scale 1:20000

0 5000 Feet

38

(Joins sheet 31)

N

B R A D D O C K

M O U N T A I N

J E F F E R S O N

D I S T R I C T

B A L L E N G E R

Mt Zion Church

Feagaville

Ballenger Creek

Jefferson

BUCKEYSTOWN

840

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 44)

(Joins sheet 45)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 32)

(Joins sheet 38)

(Joins sheet 40)

(Joins sheet 45)

(Joins sheet 46)

BALLENGER

F R E D E R I C K

B U C K E Y S T O W N

N E W M A R K E T

U R B A N A

Grove

LIMESTONE QUARRY

MINE DUMP

Bartonsville

Frederick Junction

Reels Mill

Ballenger Creek

Bush Creek

U. S. 40

UNDER CONSTRUCTION

OHIO AND BALTIMORE RIVER

BALTIMORE AND OHIO

MONOCACY

N

0 1/2 1 Mile

Scale 1:20000

0 5000 Feet

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1952.

(Joins sheet 33)

N

(Joins sheet 39)

(Joins sheet 41)

Bartonsville

Mt Carmel Church

Long Branch

N E W M A R K E T

New Market

Monrovia

Bush Creek

BALTIMORE AND OHIO

U R B A N A

Ijamsville

(Joins sheet 46

(Joins sheet 47)

Scale 1:20 000

(Joins sheet 34)

N

(Joins sheet 40)

(Joins sheet 42)

NEW MARKET

WOODVILLE

New Market

Bartholows

German Brethren Church

Hazelnut Run

Beans Branch

Bush Creek

Creekways

BALTIMORE AND OHIO

(Joins sheet 47)

½ (Joins sheet 48)

0 1 Mile

Scale 1:20000

0 5000 Feet

FREDERICK COUNTY, MARYLAND - SHEET NUMBER 42

(Joins sheet 35)

N

(Joins sheet 41)

(Joins sheet 48)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 36)

(Joins sheet 37)

N

(Joins sheet 44)

WASHINGTON COUNTY

SOUTH MOUNTAIN

PETERSVILLE

LOUDOUN COUNTY

VIRGINIA

POTOMAC RIVER

ABANDONED RAILROAD CANAL

YARDS

BRUNSWICK

Petersville

Slabtown

St Marks Church

Rosemont

Knoxville

Brunswick

Rt 34

Rt 40

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins inset, sheet 53)

(44)

(Joins sheet 37)

(Joins sheet 38)

N

(Joins sheet 43)

(Joins sheet 45)

(Joins sheet 49)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

FREDERICK COUNTY, MARYLAND - SHEET NUMBER 45

(Joins sheet 38)

(Joins sheet 39)

45

N

B A L L E N G E R

B U C K E Y S T O W N

JEFFERSON

Church Hill

Lime Kiln

Keller

Buckeystown

Buckeystown Station

St Josephs Carrollton Manor

QUARRY

OLAGGETT DIOCESAN CENTER

Tuscarora Creek

Rocky Creek

Horsehead Creek

Tuscarora

Catoctin Mountain

OHIO AND BALTIMORE

MONOCACY RIVER

URBANA

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 50)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 39) | (Joins sheet 40)

N

Reels Mill

NEW MARKET

Hope Hill

URBANA

Urbana

Centerville

BUCKEYSTOWN

MONOCACY

RIVER

Baltimore and Ohio

Bush Creek

Bennett Creek

North Branch

(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 51)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

FREDERICK COUNTY, MARYLAND - SHEET NUMBER 47

(Joins sheet 40)

(Joins sheet 41)

47

N

(Joins sheet 46)

(Joins sheet 48)

Hamsville

BALTIMORE AND OHIO

Branch

N E W M A R K E T

U R B A N A

Fahrney

Fountain Mills

Pleasant Grove Church

MONTGOMERY CO

(Joins sheet 52)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 41) | (Joins sheet 42)

N

(Joins sheet 47)

WOODVILLE

NEW MARKET

Kemptown

CARROLL COUNTY

MONTGOMERY COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 44)

N

(Joins inset, sheet 53)

(Joins sheet 50)

PETERSVILLE

BALTIMORE AND OHIO CANAL ABANDONED

POTOMAC

VIRGINIA

Catoctin Sta

JEFFERSON

CATOCTIN MOUNTAIN

BUCKEYSTOWN

LOUDOUN COUNTY

Patonian RIVER

Point of Rocks

Heaters Island

Rock Hall

(Joins sheet 53)

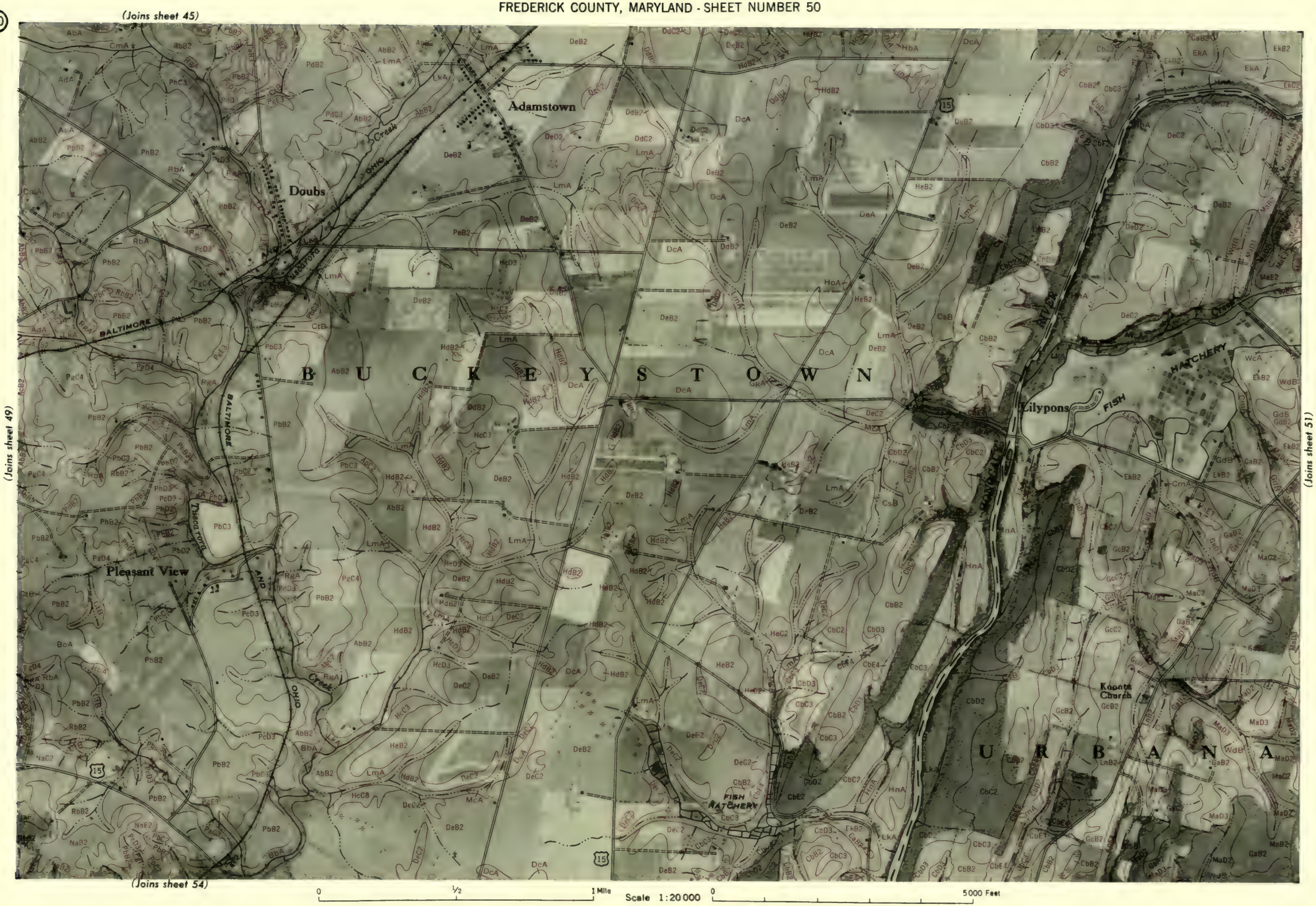
0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

50

FREDERICK COUNTY, MARYLAND - SHEET NUMBER 50



(Joins sheet 46)

(Joins sheet 50)

(Joins sheet 52)

(Joins sheet 55)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(52)

(Joins sheet 47)

(Joins sheet 51)

N

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 49)

N

Heaters Island

BUCKEYSTOWN

POTOMAC RIVER

LOUDOUN COUNTY

BALTIMORE ABANDONED AND OHIO CANAL

Mason Island

VIRGINIA

(Joins sheet 54)

(Joins sheet 43)

Brunswick

BRUNSWICK

BALTIMORE RAILROAD YARDS AND ABANDONED OHIO CANAL

PETERSVILLE

LOUDOUN COUNTY

POTOMAC RIVER

VIRGINIA

(Joins sheet 49)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 50)

N

(Joins sheet 53)

(Joins sheet 55)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 51)

(Joins sheet 54)

SUGARLOAF MOUNTAIN

URBANA

Bells Chapel

Furnace Branch

MONTGOMERY COUNTY

N

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet